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TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1940

No. 218

RAILROAD COMMISSION OF TEXAS, LON A. SMITH, ERNEST O. THOMPSON AND JERRY SADLER, MEMBERS OF THE RAILROAD COMMISSION OF TEXAS, ET AL., APPELLANTS,

vs.

ROWAN & NICHOLS OIL COMPANY

APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF TEXAS

FILED JULY 8, 1940.

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INDEX.

	Original	Print
Record from D. C. U. S., Western District of Texas	1	1
Caption (omitted in printing)	1	
Original complaint	2	1
Exhibit "A"—Oil and gas lease, January 13, 1931	20	15
Exhibit "B"—Order of Commission amending Rule No. 37, May 29, 1934	26	20
Exhibit "C"—Order of Commission fixing allowable production of crude oil, December 20, 1939	28	22
Exhibit "C-1"—Same, September 11, 1939	31	24
Answer	35	27
Supplemental complaint	46	36
Answer to supplemental complaint	54	42
Order convening statutory three-judge court (omitted in printing)	59	

JUDD & DETWEILER (INC.), PRINTERS, WASHINGTON, D. C., OCTOBER 23, 1940.

Record from D. C. U. S., Western District of Texas—Continued	Original	Print
Writ to serve copy of order convening statutory three-judge court (with copy of complaint attached) on Governor W. Lee O'Daniel (omitted in printing)	60	
Writ to serve copy of order convening statutory three-judge court on Railroad Commission of Texas, Lon A. Smith, et al. (omitted in printing)	62	
Statement of evidence	64	45
Caption	64	45
Preliminary discussion	65	46
Testimony of I. L. Sorenson:		
Direct examination, by Mr. Baker	70	49
Plaintiff's Exhibit No. 1—Large map of the East Texas field. Offer of	72	51
Plaintiff's Exhibit No. 2—Index map. Offer of	73	51
Plaintiff's Exhibit No. 3—Contour map. East Texas Field, contoured on top of Woodbine sand. Offer of	74	52
Plaintiff's Exhibit No. 4—Isopach map of East Texas Field. Offer of	75	53
Plaintiff's Exhibit No. 5—Map. Offer of	76	54
Plaintiff's Exhibit No. 6—Cross-section chart. Offer of	88	62
Examination by Mr. Hart	89	63
Plaintiff's Exhibit No. 7—Tabulation. Offer of	97	68
Cross-examination, by Mr. Fischer	97	68
Examination by Mr. Moody	103	72
Cross-examination, by Mr. Hart	104	73
Redirect examination, by Mr. Baker	147	103
Recross-examination, by Mr. Moody	149	105
Recross-examination, by Mr. Hart	150	105
Testimony of T. V. Moore:		
Direct examination, by Mr. Baker	153	107
Plaintiff's Exhibit No. 8—Order of the Railroad Commission dated September 11, 1939. Offer of	163	114
Plaintiff's Exhibit No. 8-A—Order of the Railroad Commission dated September 29, 1939. Offer of	163	114
Plaintiff's Exhibit No. 10—Order and schedule. Offer of	164	115
Plaintiff's Exhibit No. 11—Order and schedule. Offer of	164	115
Plaintiff's Exhibit No. 12—Order and schedule. Offer of	164	115
Plaintiff's Exhibit No. 13—Order and schedule. Offer of	164	115

	Original	Print
Record from D. C. U. S., Western District of Texas—Continued		
Statement of evidence—Continued		
Testimony of T. V. Moore:		
Direct examination resumed, by Mr. Baker	131	125
Plaintiff's Exhibit No. 14—Table No. I. Offer of	184	128
Plaintiff's Exhibit No. 15—Table No. II. Offer of	185	129
Plaintiff's Exhibit No. 16—Table No. III. Offer of	187	129
Plaintiff's Exhibit No. 17—Table No. IV-A. Offer of	188	130
Plaintiff's Exhibit No. 18—Table No. IV-B. Offer of	189	131
Plaintiff's Exhibit No. 19—Chart. Offer of.	192	133
Plaintiff's Exhibit No. 20—Chart. Offer of.	196	136
Plaintiff's Exhibit No. 21—Chart. Offer of.	197	136
Plaintiff's Exhibit No. 22—Chart. Offer of.	197	137
Plaintiff's Exhibit No. 23—Chart. Offer of.	198	137
Plaintiff's Exhibit No. 24—Chart. Offer of.	199	138
Plaintiff's Exhibit No. 25—Chart. Offer of.	199	138
Cross-examination, by Mr. Fischer	206	143
Cross-examination, by Mr. Moody	217	150
Cross-examination, by Mr. Hart	227	157
Redirect examination, by Mr. Baker	252	175
Recross-examination, by Mr. Moody	257	178
Recross-examination, by Mr. Fischer	258	179
Recross-examination, by Mr. Moody	259	180
Recross-examination, by Mr. Hart	260	180
Redirect examination, by Mr. Baker	262	182
Offer of complainant's supplemental bill of complaint	265	183
Offer by Rowan & Nichols Oil Company of portions of testimony of I. L. Sorenson	266	184
Offer by Rowan & Nichols Oil Company of Exhibits 8 to 25, inclusive	266	185
Offer by Rowan & Nichols Oil Company of portions of testimony of T. V. Moore	267	185
Offer by Rowan & Nichols Oil Company o fcopy of order of Railroad Commission, dated December 20, 1939	267	185
Testimony of A. H. Rowan:		
Direct examination, by Mr. Moody	268	185
Plaintiff's Exhibit No. 26—Schedule. Offer of	285	198
Cross-examination, by Mr. Baker	293	204
Cross-examination, by Mr. Fischer	294	204
Cross-examination, by Mr. Hart	297	206
Redirect examination, by Mr. Moody	304	211
Recross-examination, by Mr. Hart	312	217
Redirect examination, by Mr. Moody	313	218
Recross-examination, by Mr. Hart	314	218
Redirect examination, by Mr. Moody	315	219

	Original	Print
Record from D. C. U. S., Western District of Texas—Continued		
Statement of evidence—Continued		
Testimony of E. O. Buck:		
Direct examination, by Mr. Moody	317	221
Plaintiff's Exhibit No. 27—Chart. Offer of	321	223
Plaintiff's Exhibit No. 28—Chart. Offer of	348	243
Testimony of E. O. Buck:		
Direct examination resumed, by Mr. Moody	356	248
Plaintiff's Exhibit No. 29—Papers. Offer of	359	251
Plaintiff's Exhibit No. 30—Table of comparison of reserves. Offer of	359	251
Cross-examination, by Mr. Baker	376	263
Examination by Mr. Saye	378	265
Examination by Mr. Baker	392	276
Cross-examination, by Mr. Hart	396	279
Redirect examination, by Mr. Moody	415	294
Recross-examination, by Mr. Hart	418	296
Redirect examination, by Mr. Moody	423	299
Recross-examination, by Mr. Saye	423	300
Testimony of J. L. Sorenson:		
Recross examination, by Mr. Hart	426	302
Redirect examination, by Mr. Baker	434	307
Plaintiff's Exhibit No. 31—Exhibit A of Humble Oil & Refining Company's original complaint. Offer of	437	309
Plaintiff's Exhibit No. 37—Questionnaire by Railroad Commission to Humble Oil & Refining Company. Offer of	438	310
Plaintiff's Exhibit No. 38—Letter dated August 8, 1939, from Rex Baker to John E. Taylor. Offer of	438	310
Plaintiff's Exhibit No. 32—Excerpt of proceedings at hearing before Railroad Commission in Austin, Texas, on September 11, 1939. Offer of	438	310
Testimony of F. V. L. Patten:		
Direct examination, by Mr. Hart	443	314
Defendants' Exhibit No. 1—Chart. Identified	446	316
Defendant's Exhibit No. 2—Chart. Offer of	449	318
Defendants' Exhibit No. 3—Chart. Offer of	453	321
Defendants' Exhibit No. 4—Chart. Offer of	454	322
Defendants' Exhibit No. 5—Chart. Offer of	454	322

	Original	Print
Record from D. C. U. S., Western District of Texas—Continued		
Statement of evidence—Continued		
Testimony of F. V. L. Patten—Continued		
Direct examination, by Mr. Hart—Continued		
Defendant's Exhibit No. 6—Chart. Offer of	454	322
Defendant's Exhibit No. 7—Map. Offer of	470	334
Defendants' Exhibit No. 8—Tabulation. Offer of	471	335
Defendants' Exhibit No. 9—Tabulation. Offer of	473	337
Defendants' Exhibit No. 10—Tabulation. Offer of	474	337
Cross-examination, by Mr. Moody	476	339
Questions by Mr. Baker	499	356
Questions by Mr. Moody	503	359
Redirect examination, by Mr. Hart	504	360
Testimony of J. S. Hudnall:		
Direct examination, by Mr. Hart	506	360
Defendant's Exhibit No. 11—Map. Offer of	510	363
Defendant's Exhibit No. 12—Map. Offer of	510	363
Defendant's Exhibit No. 13—Map. Offer of	510	363
Defendant's Exhibit No. 14—Map. Offer of	510	363
Cross-examination, by Mr. Baker	530	378
Questions by Mr. Moody	549	393
Cross-examination, by Mr. Saye	582	416
Cross-examination, by Mr. Baker	583	417
Redirect examination, by Mr. Hart	587	420
Recross-examination, by Mr. Moody	589	422
Testimony of Ionel I. Gardescu:		
Direct examination, by Mr. Hart	591	422
Cross-examination, by Mr. Baker	597	427
Redirect examination, by Mr. Hart	606	434
Defendants' Exhibit No. 15—Order of the Railroad Commission dated July 13, 1939. Offer of	607	434
Defendants' Exhibit No. 16—Certified copy of order of the Railroad Commission dated August 26, 1935. Offer of	607	434
Stipulation of counsel as to certain facts	608	435
Excerpts from Railroad Commission hearing of August 16, 1939. Offer of	609	436
Tabulation showing permits to drill wells as exceptions to Rule 37 granted to Humble Oil & Refining Company up to February 12, 1940. Offer of	611	437

	Original	Print
Record from D. C. U. S., Western District of Texas—Continued		
Statement of evidence—Continued		
Testimony of E. O. Buck (recalled):		
Direct examination, by Mr. Moody	614	439
Examination by Mr. Hart	615	440
Plaintiff's Exhibit No. 34—Certified copy of order of the Railroad Commission dated September 2, 1931. Offer of	617	441
Plaintiff's Exhibit No. 35—Certified copy of order of the Railroad Commission dated March 23, 1936. Offer of	617	441
Plaintiff's Exhibit No. 36—Certified copy of order of the Railroad Commission dated February 24, 1936. Offer of	618	442
Excerpts from transcript of testimony and proceedings at hearing before Railroad Commission on August 16, 1939	619	443
Reporter's certificate (omitted in printing)	622	
Documentary Evidence		
Plaintiff's Exhibit "A"—Stipulation	623	445
Plaintiff's Exhibit No. 1—Large map of the East Texas Field. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 2—Index Map. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 3—Contour map—East Texas Field, contoured on top of Woodbine Sand. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 4—Isopach map of East Texas Field. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 5—Map. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 6—Cross-section chart. (Original accompanies record herein).		
Plaintiff's Exhibit No. 7—Tabulation	625	446
Plaintiff's Exhibit No. 8—Order of Railroad Commission dated September 11, 1939	626	446
Plaintiff's Exhibit No. 8-A—Order of Railroad Commission dated September 29, 1939	631	450
Plaintiff's Exhibit No. 9—Map. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 10—Order of Railroad Commission dated January 24, 1940	642	457
Plaintiff's Exhibit No. 11—Order and schedule. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 12—Order of Railroad Commission dated January 24, 1940	652	465
Plaintiff's Exhibit No. 13—Order of Railroad Commission dated January 24, 1940	655	466
Plaintiff's Exhibit No. 14—Table I	658	469

Record from D. C. U. S., Western District of Texas—Continued
Statement of evidence—Continued

Documentary Evidence—Continued

	Original	Print
Plaintiff's Exhibit No. 15—Table II	659	470
Plaintiff's Exhibit No. 16—Table III	662	473
Plaintiff's Exhibit No. 17—Table IV-A	663	474
Plaintiff's Exhibit No. 18—Table IV-B	664	475
Plaintiff's Exhibit No. 19—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 20—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 21—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 22—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 23—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 24—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 25—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 26—Schedule	665	476
Plaintiff's Exhibit No. 27—Chart	666	477
Plaintiff's Exhibit No. 28—Map. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 29—Table of comparison	667	478
Plaintiff's Exhibit No. 29-A—Chart. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 30—Table of comparison	668	479
Plaintiff's Exhibit No. 31—Exhibit A. Dated June 16, 1939, and addressed to the Railroad Commission	669	481
Plaintiff's Exhibit No. 32—Excerpt of proceedings at hearing before Railroad Commission in Austin, Texas, on September 11, 1939. (Original accompanies record herein.)		
Plaintiff's Exhibit No. 33—Certified copy of tabulation. (Original accompanies record herein)		
Plaintiff's Exhibit No. 34—Order of the Railroad Commission dated September 2, 1931	676	486
Plaintiff's Exhibit No. 35—Order of Railroad Commission dated March 23, 1936	685	492
Plaintiff's Exhibit No. 36—Order of Railroad Commission dated February 24, 1936	694	499
Plaintiff's Exhibit No. 37—Questionnaire by Railroad Commission to Humble Oil & Refining Company	703	506
Plaintiff's Exhibit No. 38—Letter dated August 8, 1939	705	507
Defendants' Exhibit No. 1—Chart. (Original accompanies record herein.)		

	Original	Print
Record from D. C. U. S., Western District of Texas—Continued		
Statement of evidence—Continued		
Documentary Evidence—Continued		
Defendants' Exhibit No. 2—Chart. (Original accompanies record herein.)		
Defendants' Exhibit No. 3—Chart. (Original accompanies record herein.)		
Defendants' Exhibit No. 4—Chart. (Original accompanies record herein.)		
Defendants' Exhibit No. 5—Chart. (Original accompanies record herein.)		
Defendants' Exhibit No. 6—Chart. (Original accompanies record herein.)		
Defendants' Exhibit No. 7—Map. (Original accompanies record herein.)		
Defendants' Exhibit No. 8—Tabulation	707	508
Defendants' Exhibit No. 9—Table showing number of wells producing salt water	711	511
Defendants' Exhibit No. 10—Tabulation showing varying density	713	512
Defendants' Exhibit No. 11—Map. (Original accompanies record herein.)		
Defendants' Exhibit No. 12—Map. (Original accompanies record herein.)		
Defendants' Exhibit No. 13—Map. (Original accompanies record herein.)		
Defendants' Exhibit No. 14—Map. (Original accompanies record herein.)		
Defendants' Exhibit No. 15—Order of Railroad Commission dated July 13, 1939	714	512
Defendants' Exhibit No. 16—Order of Railroad Commission dated August 26, 1935	719	516
Opinion of the court after trial on the merits	730	524
Judgment	739	530
Findings of fact and conclusions of law	743	533
Motion for stay of judgment	765	551
Petition for appeal	772	556
Assignment of errors	774	557
Order allowing appeal	823	563
Citation and service (omitted in printing)	825	
Appeal bond (omitted in printing)	827	
Stipulation as to record on appeal	829	564
Clerk's certificate (omitted in printing)	834	
Statement of points to be relied upon and stipulation as to printing of record	835	566

[fols. 1-2]

IN UNITED STATES DISTRICT COURT FOR THE WESTERN DISTRICT OF TEXAS, AUSTIN DIVISION

No. 46 Civil Action

ROWAN & NICHOLS OIL COMPANY

vs.

RAILROAD COMMISSION OF TEXAS, et al.

ORIGINAL COMPLAINT—Filed January 22, 1940

To Said Honorable Court:

Comes now Rowan & Nichols Oil Company, hereinafter styled Complainant, and complaining of the Railroad Commission of Texas, Lon A. Smith, Jerry Sadler, Ernest O. Thompson, and Gerald C. Mann, in their official and individual capacities, hereinafter styled Respondents, files this, its Original Bill of Complaint, and for cause of action, respectfully represents to said Court as follows:

I

Complainant is a private corporation, duly organized and existing under and by virtue of the laws of the State of Texas, with principal domicile in Fort Worth, Tarrant County, Texas; Respondent Railroad Commission of Texas is a duly created and existing agency of the State of Texas, charged with the administration of the conservation laws of the State of Texas affecting oil and gas production, and Respondents Lon A. Smith, Jerry Sadler, and Ernest O. Thompson are the duly elected, qualified, and acting members of said Commission, of which Lon A. Smith is Chairman, and reside in Travis County, Texas. Respondent Gerald C. Mann is the duly elected, qualified, and acting Attorney General of the State of Texas, with official residence in Travis County, Texas, where service may be had [fol. 3] on said Railroad Commission by delivery of process to C. F. Petet, who resides in Travis County, Texas. That W. Lee O'Daniel is Governor of the State of Texas and resides in Austin, Travis County, Texas, where service may be had upon him if the same be required by law.

II

The jurisdiction of the subject-matter and parties in this cause is vested in this Court upon the following grounds:

(a) This suit is of a civil nature and arises under the constitution and laws of the United States of America, as hereinafter more fully set out, and the orders complained of are especially repugnant to the due process and equal protection clauses of the Fourteenth Amendment to the Constitution of the United States.

(b) The value of the property and the amount involved is in excess of $3,000.00, exclusive of interest.

III

Complainant is the owner of an oil, gas, and mineral leasehold estate in a certain 28.25 acre tract of land situated and located in the W. H. Castleberry League in Gregg County, Texas, B. C. Todd, et al., fee owners, more particularly described in the lease attached hereto, marked Exhibit "A", and made a part hereof, said oil and gas lease being recorded in the Oil and Gas Lease Records of Gregg County, Texas, Volume 63, Page 485, et seq., to which reference is here made. Thereunder Complainant owns seven-eighths (7/8) of the oil, gas, and other minerals in place under said land and the right to enter thereon and by mining operations reduce said minerals to physical possession, and has seven (7) wells drilled in accordance with existing rules and regulations and orders of the Railroad Commission and producing oil from said land. Complainant is producing from said lands in accordance with the order of [fol. 4] the Railroad Commission of Texas, dated December 20, 1939, the following number of barrels of oil per day, five days a week, Saturdays and Sundays excluded, by wells, as hereinafter shown, and the thickness of the sand, bottom hole pressure, and potentials of each of said wells are as follows:

Well	Production	Sand Thickness	Bottom Hole Pressure	Potential
#1	36.63	91	1115	960
#2	37.81	97	1115	965
#3	37.24	94	1115	964
#4	38.00	98	1115	965
#5	36.63	91	1115	960
#6	37.44	95	1115	965
#7	36.81	92	1115	960

IV

(a) Complainant's lease and the wells producing thereon are located in what is known as the East Texas oil field. Said field is water-driven and embraces a territory of about forty miles in length and four miles in width. The west side of the field is underlain with what is known as "bottom water"; no water underlies the east half, and the water is slowly but perceptibly rising in the western portion thereof, one well to ten acres can reasonably drain such area in the East Texas field during the flowing life thereof, if produced under proper restrictions and in accordance with good petroleum practice; said field is substantially a flowing field. There are approximately 133,000 acres underlain by oil in said field, and the average sand thickness of the oil bearing sand is 42 feet, whereas the average sand thickness under Complainant's lease is between 94 feet (as shown by the Railroad Commission's findings) and 100 feet; there are approximately 5,586.00 acre feet of oil sand in the entire field and 2655.50 acre feet of oil sand under Complainant's lease; the allowable production of oil from said field as of December 20, 1939, was 690,000 barrels per producing day, and from Complainant's said lease, as of December 20, 1939, [fol. 5] 260.56 barrels per producing day; the average controlled potential of a well in East Texas is 605 barrels, and the average controlled potential of each well on Complainant's lease is approximately 965 barrels. The average bottom hole pressure for said seven wells is 1115 barrels, and the average sand thickness is 94 feet. The average bottom hole pressure for every well in the field was 1066.46 pounds on December 8, 1939, and the average sand thickness of the oil bearing sand is 42 feet. As of December 20, 1939, there were approximately 26,000 wells producing and authorized to be drilled in said field, of which number over 60% were allowed as exceptions to Rule 37 of the rules and regulations of the Railroad Commission, copy of which is attached hereto and marked Exhibit "B"; the uncontrolled potential of wells in said field varies from less than 20 barrels and as low as 2 or 3 barrels per day per well, to between 25,000 and 30,000 barrels per well per day. Complainant's wells are situated in what is known as the "Gladewater Nose", which is most favorably situated on the structure and producing horizon of the East Texas field, almost equidistant between the eastern and western limits thereof.

The oil saturated sands thereunder are of maximum thickness, and there is no danger of encroachment of water, at the present time and for a long time to come, with the result that said wells can be continually produced for many months without an excessive oil and gas ratio and with no physical waste, and without the danger of creating an element set forth in the statutes which would authorize Respondents to artificially restrict production from Complainant's wells except under reasonable exercise of the State's police power. The oil production sands to the East of Complainant's property are of continually decreasing thickness, pinching out to nothing on the eastern edge. None of the wells lying betweem Complainant's property and the Eastern edge are capable of producing nearly as much oil as Complainant's [fol. 6] wells, and none of the wells lying between Complainant's property and the western edge of the field are capable of producing for as long a time as Complainant's wells, unless by artificial methods of restriction, such as the Commission is now requiring, Complainant's production is cut down. If the field is produced in an orderly manner, and as near ratably as may be, each person withdrawing oil underlying his land, and which can be brought to his well by proper production methods, will produce from his well in accordance with the advantage of its situation.

(b) The total recoverable oil under Complainant's lease, based upon the porosity, permeability, oil saturation, and thickness of the sand underlying the lease, is approximately 57,000 barrels per acre, and the total recoverable oil in the common pool existing in the East Texas field is approximately 2,500,000,000 barrels.

V

(a) Under the laws of the State of Texas as construed by the decisions of the highest Court in the State of Texas an operator of an oil and gas lease is the owner in severalty of the oil and gas in place beneath the land under the lease to him and has a property right entitling him to an opportunity equal to that of adjoining operators in the production of oil from the common reservoir. Likewise he has no cause of action for damages by reason of the recovery through drainage by his neighbor of the oil originally underlying his tract, and by reason of the provisions of Rule 37 is not entitled to the same degree of self help for the pro-

tection from drainage as was accorded to him under the common law rule of capture.

(b) There has been ascertained and can be ascertained in the East Texas field accurate information as to the sand thickness, properties of the reservoir sands, and their fluid [fol. 7] contents; so as to estimate the quantities of oil and gas present as of any particular date, in almost any portion of the reservoir. The computation can be made and has been made with a degree of accuracy which is sufficiently precise to establish a basis for an equitable and reasonable allocation of production to the owners of oil and gas in place, so as to accord unto each one an equal opportunity to recover his fair share of the oil, as has been done in other fields where sand conditions are not as uniform as those in East Texas. Respondent Commission has made a survey of said field and knows the sand thickness of each and every well therein, the bottom hole pressure and the potential for each and every well therein.

VI

(a) Complainant is now being compelled to artificially restrict its production from its lease by order of said Respondent Commission, dated December 20, 1939, copy of which is attached hereto and marked exhibit "C". By said order of December 20, Rule 23 of Division 3, as contained in an order of the Commission dated October 17, 1933, pertaining to the East Texas field, as amended by the Commission by order dated September 11, 1939, copy of which latter order is attached hereto and marked Exhibit "C-1," provides that during the month of January, 1940, the allowable production should not average more than 450000 barrels per day over the thirty day period, and that no more than 690,000 barrels of crude oil should be produced from the East Texas field in any one day during the month of January, 1940, said 690,000 barrels to be produced in the following manner:

"(b) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

"1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) barrels per day.

[fol. 8] "2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels.

"3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of producing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deductions for one (1) and two (2) above have been made, that the product of such well's hourly potential by its bottomhole pressure by the thickness of the saturated Woodbine Sand underlying the well by the average number of acres per well in the lease bears to the sum of such products for all of the wells in the field."

(b) That under said order and in the enforcement and application of same to Complainant, Respondent Commission and Respondents do not allocate among wells or among leases the daily field allowable on the basis of the factors prescribed and enumerated therein, but, on the contrary, arbitrarily give to each well in the field that is capable of making as much as 20 barrels of oil per day, a base or minimum allowable of 20 barrels. This base or minimum allowable is granted without regard to the ability of a well to produce in excess of 20 barrels of oil per day and without regard to the size of the tract of land upon which the well has been drilled or the density of drilling on the tract and without regard to whether the well is a flowing or pumping well and without regard to whether such base or minimum production of 20 barrels is necessary to prevent waste, injury to the well, premature abandonment of the well, or loss of oil that would otherwise be recoverable.

(c) The thus granting to each well in the field capable of making as much as 20 barrels per day, a base or minimum allowable of 20 barrels, and the then application of the factors above mentioned for determining the amount of oil that wells may daily produce in excess of 20 barrels, operates to deprive Complainant of its fair share of the [fol. 9] daily allowable from the field and denies to it the equal protection of the law, and results in a taking of its property without due process of law.

(d) The application and enforcement of said order operates to deny to Complainant an equal opportunity with others in said field, and results in drainage of Complainant's Todd "A" lease, and in denial to Complainant of the equal protection of the law and in a taking of Complainant's property without due process of lay, and a loss to it daily of more than 60% of its present daily allowable, with the market value of oil at the present time the sum of $1.10 per barrel in said field.

(e) When the recoverable reserves under Complainant's Todd "A" lease are considered in relation to the recoverable reserves in the field, and when the position of said lease on the structure is considered, Complainant is entitled to produce daily approximately sixty per cent (60%) more oil from its Todd "A" lease than it is now allowed under said rules and regulations as enforced and applied by the Commission.

(f) The factors used by the Respondents, and especially the Commission, in allocating among wells the daily field allowable, do not allow wells or leases to produce in any reasonable relation of the recoverable reserves of said wells and leases to the recoverable reserves in the field or allow an equal opportunity of production among different well and lease owners and operators.

(g) Notwithstanding the right of Complainant to produce its fair share of the oil as long as the same can be produced without creating waste, if other operators in said field were curtailed in the production from tracts and/or wells, pumping or flowing, to 5 barrels per day, and in some instances less, no waste would be created, and said operators would, in such event, be entitled to recover their fair share of the oil, and, in many instances, more, but Respond- [fol. 10] ents have wholly failed and refused to reduce allowables in said East Texas field below 20 barrels per day and are now unlawfully and arbitrarily refusing to do so.

VII

(a) The potentials used by the Commission in allocating the field allowable among wells in the field are largely fictitious, and in using said potentials as factors in calculating the amount of oil which wells in said field are allowed to produce above the base or minimum of 20 barrels, the

system of proration and allocation so applied and enforced in the field operates to deprive Rowan & Nichols Oil Company of an equal opportunity with others and results in drainage of Rowan & Nichols Oil Company's Todd "A" lease, and in a denial to Rowan & Nichols Oil Company of equal protection of the law and in a taking of Rowan & Nichols Oil Company's property without due process of law.

(b) Under said order, Complainant is placed in the position either of surrendering its property through drainage or being compelled to drill additional and unnecessary wells, if permit therefor is granted by the Commission, to offset the drainage caused by the granting of other wells on small tracts as more particularly hereinafter set out. Respondent Commissioners have publicly announced that they do not take into consideration the confiscatory cost of drilling offsets and regard an operator's only remedy as that of offset, whatever the cost may be, to prevent drainage of his property under the allocation of allowable, and do not consider that proration or ratable production bears any relation to or has any connection with the drilling of wells. Said plan of proration entirely disregards differences as to each well in its productive capacity, situation on the structure, thickness and character as to the richness and yield of the underlying sands, and the density to which leases have [fol. 11] been drilled, and proximity of water. By reason of said order and its artificial restriction methods, Complainant's allowable does not bear the same proportion to the total daily allowable as the recoverable oil under its lease bears to the total recoverable oil in said East Texas field.

VIII

(a) The plan of proration now maintained does not take into consideration acreage of leases or density of drilling on leases, with the result that an operator having one well on one acre may recover daily and ultimately ten times as many barrels of oil per acre as the operator of an adjoining lease which is drilled to a density of only one well to ten acres, although the amount of recoverable oil per acre under each lease is the same, and thereby the operators of the more densely drilled tract are given an advantage over the operators of the adjoining less densely drilled tract in the production of oil in violation of the declared property right,

and such operator of the more densely drilled area is allowed to drain and take oil belonging to the operators of the adjoining tract. For example, Respondent Commission has granted a permit to R. M. Wood on a strip immediately to the south of Complainant's "A" lease a few hundred feet, comprising approximately one-tenth (1/10) of an acre, and he has been permitted to produce from one well, since its completion on August 22, 1937, an average of about 23 barrels per day, which is almost as much as Complainant is permitted to produce from any one of its wells, although Complainant's lease comprises more than two hundred eighty (280) times as much acreage and as much acre feet of saturated sand, and has more than two hundred eighty (280) times as much recoverable oil as the said Wood. That the average per acre allowable for said Wood lease at this time, for illustration, is 241.10 barrels per acre, as com- [fol. 12] pared with Complainant's average per acre allowable on its Todd lease of about 9 barrels per acre per day.

(b) There are contained in the East Texas field many hundreds of tracts of less than five acres, and of less than ten acres, on which the Commission has authorized the drilling of an average of one well to one acre. From many of these tracts, the production has been far in excess of the amount of oil which underlay same and by reason of the plan of proration herein complained of said tracts, and particularly those to the east of Complainant's lease, have as much oil under same as had originally been there. The rate of the withdrawal from each well on said tracts has been substantially equal to that of Complainant's wells. Said numerous tracts, by reason of the present plan of proration, have been draining the recoverable oil and dissipating the producing energy from Complainant's land, and their reserves have arisen and will continue to rise while Complainant's will decrease and continue to decrease. If the present proration plan is maintained, Complainant will lose oil to which it is entitled to the wells on the east side of the field, long prior to the exhaustion of the oil and gas in the reservoir, the water will saturate Complainant's wells, drowning them out, and sands lying to the east will produce the oil which will have been driven from Complainant's lease to theirs, as a result of all of which said order is discriminatory, confiscatory, oppressive, and grossly inequitable.

IX

Complainant is entitled to the fullest use and enjoyment of its property and to the recovery of the minerals thereunder, co-extensive with the use and enjoyment of other properties situated in said field, and so long as Complainant's use and enjoyment does not interfere with the use [fol. 13] and enjoyment by others of their properties in said field and does not conflict with the public welfare, Complainant is entitled to exercise its rights of ownership and the reasonable use of its property, if it can ratably recover the minerals to which it is legally and constitutionally entitled according to the favorable position and amount of its acreage, the sand thickness, bottom hole pressure, and other proper determinative factors of ultimate recovery therefrom without committing physical waste and without unreasonably interfering with others in the enjoyment of their properties located in said field and consistent with the reasonable requirements of public welfare.

X

(a) Complainant can produce what it contends is its fair share of the oil and daily allowable without causing waste and alleges that its request is proper, reasonable, and fair, and one to which it is entitled to under the Constitution and laws of this State and the United States.

(b) Complainant can produce from its wells the amount of oil to which it is equitably entitled without dissipation of the gas energy or water drive, injury to the sands, or other formation, with reasonable gas-oil ratio, without any underground or other waste, without unlawful injury to the property of adjoining lessees, and without violating any of the statutes or orders of the Commission, with reference to waste, other than those complained of herein, and all of which oil so produced will not be in excess of the market demand.

XI

(a) On or about the 22nd day of December, 1939, Complainant filed with the Railroad Commission of Texas an application requesting an adjustment of allowable so that it would have an equal opportunity to recover its fair share of oil, and requesting said Commission to enter a reasonable [fol. 14] and equitable order, pointing out the arbitrariness

of said 20 barrel minimum allowable for each and every well in the field, regardless of its potential or the size of the tract upon which it was located, but said Commission has wholly failed to grant said relief or to in anywise change said order.

(b) That on or about November 1, 1939, said Complainant, through its counsel, protested the present order and complained of said 20 barrel minimum allowable at a statewide hearing on said East Texas field, but said Commission wholly failed and refused to take any action whatsoever on said protest. That others have likewise appeared before said Commission and protested said order and said 20 barrel minimum allowable as being arbitrary, capricious, unreasonable, without color of authority, and without basis in fact or in law.

XII

By maintaining its present order, the Respondent Commission and said Respondents have knowingly maintained illegal orders, which has resulted in many operators obtaining more than their fair share of the oil, for which no penalty can be imposed, and all of which has resulted in the drainage of Complainant's property and has resulted in discrimination in that Complainant has attempted to abide by the law and the orders of the Commission and will be subjected to heavy penalties, fines, and forfeitures if it produces more than the amount allocated under said order and set forth herein, and will be subjected to expensive litigation if it attempts to produce more oil than is allowed under said order.

XIII

Unless said order is declared null and void, Complainant fears that it will be sued by its royalty owners for damages and for forfeiture of its lease, because the present disparity in development and allowable production will [fol. 15] result in an allegation and contention that Complainant has failed to properly develop and produce its lease, all of which is due to said order of the Respondent Commission.

XIV

The value of the amount of oil which has already been wrongfully drained from Complainant's property is over

$50,000.00, and the value of the oil which is migrating from Complainant's lease and which will continue to migrate by reason of the maintenance of said order, is far in excess of $60,000.00.

XV

(a) That if any of the laws of this State authorize or justify the order complained of herein, said law or laws are invalid and unconstitutional for the same reasons given for the attack upon the order herein complained of. Complainant does not complain of the law under which said order was enacted, other than as is herein specifically set forth; but, on the contrary, has always been a staunch and ardent supporter of the theory and practice of proration in the orderly production of oil, and has employed counsel and witnesses to appear before the Commission at its various hearings to insist upon the promulgation of a fair and equitable distribution of the allowable, but Respondent Commission has ignored its efforts and pleas in the premises, and Respondents have arbitrarily and with wanton disregard of the rights of Complainant, entered and promulgated orders which are arbitrary, unreasonable, and confiscatory.

(b) That said arbitrary allowance of 20 barrels per well or so much oil as any well is able to produce below 20 barrels if on the pump, or otherwise, is purportedly authorized by said Commission under a misinterpretation of the so-called "Marginal Well Law," Vernon's Revised Civil Statutes, Article 6049b, Acts of the Forty-Third Legislature, Regular Session, Chapter 97, the decisions of this and other courts to the contrary notwithstanding. That if said so-called Marginal Well Law does require the Commission to give any pumping well at the depth in the East [fol. 16] Texas field of approximately 3,000 to 3,300 feet an allowance of 20 barrels or so much thereof as any pumping well may make during any day, the same is void because it bears no relation whatsoever to physical waste, it results in the drainage of Complainant's oil and lease, favorably situated as it is, by other operators whose leases are not so favorably situated, and the drainage of oil beneath Complainant's tract to other tracts with much less recoverable oil, takes an unreasonable and unfair part of the daily allowable away from the good wells with high potentials, favorable situated on the structure, and gives

the same to poor pumping wells with low potentials, not so favorably situated on the structure, takes Complainant's property without due process of law, denies to it the equal protection of the law, and has been both expressly and impliedly repealed by subsequent legislation regarding the prevention of waste of oil and gas by the Texas Legislature.

XVI

By reason of the allegations hereinbefore set forth, Complainant has in the past and will in the future continue to suffer irreparable loss and injury, and by reason of the allegations hereinbefore set forth, is without adequate remedy at law.

XVII

Premises considered, Complainant prays:

(1) That temporary restraining order be granted by the Court, restraining the Respondents as hereinafter prayed for until a three-judge Court can be invoked, as provided by Paragraph (3) hereof, and that said order be revised and renewed from time to time until said Court is invoked.

(2) That upon a hearing, after due notice, a preliminary injunction issue out of this Court enjoining the Respondents, their successors, and their representatives, agents, servants and employees, from attempting to enforce against [fol. 17] the Complainant in the conduct of its producing operations upon its properties in the East Texas field hereinbefore mentioned, the orders and rules governing production in said East Texas Field, as set forth in Exhibit "C", adopted by the Commission on December 20, 1939, and from enforcing against Complainant any of the terms and provisions of said rules and orders, as well as all renewal or extension orders, and as well as any and all similar monthly proration orders and schedules for the East Texas field; and further enjoining the Railroad Commission from enforcing against the Complainant any rules and orders governing and providing for the prorating of oil in the East Texas field that deny the Complainant a right to produce that proportion of the daily allowable that the recoverable oil under its lease bears to the total recoverable oil in the East Texas field; and further enjoining Respondents from interfering, in any way, with the pipe line company transporting the oil so produced.

(3) That a three Judge specially constituted District Court be assembled pursuant to Section 266, Judicial Code, as amended, for the purpose of hearing and determining Complainant's motion herein for interlocutory injunction; and for the purpose of conducting the final trial herein.

(4) That upon a final hearing the preliminary injunction as prayed for herein be made permanent, and that a decree be entered herein decreeing and adjudging invalid the aforesaid orders and rules of the Railroad Commission as well as all renewal and extension orders, or rules, substantially enforcing or continuing in effect the aforesaid rules on any schedule or orders that may be promulgated by the Commission following its monthly hearing extending and enforcing in principle the above described orders and schedules as they apply to Complainant; that said orders and schedules, and each of them, as they affect Complainant, be set aside, vacated and annulled; and that the Re-
[fol. 18] spondents and their successors, representatives, agents, servants and employees be permanently enjoined from enforcing said orders, rules, schedules, and any renewals or extensions thereof, against the Complainant and from taking any steps whatsoever, directly or indirectly, restricting Complainant's right to produce and secure the transportation of that proportion of the total daily recoverable oil that the recoverable oil under its lease bears to the total recoverable oil in the East Texas field, or that proportion of the daily allowable Complainant would be entitled to under said order of December 20, 1939, without giving any consideration to minimum allowable as provided therein.

(5) If the Court should be unwilling to grant at this time the permanent relief prayed for in the absence of positive action by the Railroad Commission specifically refusing or otherwise in terms disposing of the complaint presented by the Complainant to the Railroad Commission on December 22, 1939, as hereinbefore alleged, then in such contingency and in the alternative Complainant prays for the temporary relief as prayed for in Paragraph (2) of the foregoing prayer and also for final relief in the nature of a permanent or perpetual injunction to be in force at least until the Commissio shall set aside and vacated the rules and orders herein complained of until the Commission shall have substantially granted the relief or removed the injuries herein

complained of; and that such injunction herein prayed for shall remain in force so long as the Complainant is subjected to the confiscation of its properties and the injuries complained of herein by the enforcement against the Complainant of the aforesaid arbitrary rules and orders in the manner hereinabove set forth.

(6) For judgment against the Respondents for costs of suit and for such other and further relief as the evidence shall justify and as to the Court shall seem equitable in the premises.

Dan Moody, Rice M. Tilley, Attorneys for Complainant.

[fol. 19] *Duly sworn to by Rice M. Tilley. Jurat omitted in printing.*

[fol. 20] EXHIBIT "A" TO COMPLAINT

Oil and Gas Lease

Agreement, Made and entered into the 13th day of January, 1931, by and between B. Clay Todd, for himself and as attorney for C. F. Todd, B. M. Todd, and J. W. Todd of Gregg County hereinafter called lessor (whether one or more), and R. R. Rhodes hereinafter called lessee:

Witnesseth: That the said lessor, for and in consideration of Ten ($10.00) Dollars cash in hand paid, the receipt of which is hereby acknowledged, and of the covenants and agreements hereinafter contained on the part of lessee to be paid, kept and performed, has granted, demised, leased and let, and by these presents does grant, lease and let unto the said lessee for the sole and only purpose of mining and operating for oil and gas and of laying pipe lines and of building tanks power stations and structures thereon to produce, save and take care of said products, all that certain tract of land situated in the county of Gregg, State of Texas, described as follows, to-wit:

The North 50 acres out of the following described 100 acres of land, about 9 miles west of Longview, being a part of the William H. Castleberry H. R. Survey and being a part of a 215 acre tract in Lot No. 2 of said Survey and beginning at the SW. corner of a 115 acre tract conveyed to

Juan M. Bumpas a stake a pine brs. N. 86½ d. E. 5.8 vrs. Thence N. with her W. line at 973.3 vrs. her NW. cor., a stake a pine brs. N. 75 d. E. 3 vrs; Thence S. 86½ d. W. with south line of Lot No. 1 at 590½ vrs. a stake Thence S. at 973.3 vrs. a stake on N. line of Lot No. 3, Thence N. 86½ d. E. with said line at 590.1 vrs. the place of beginning, containing in all 100 acres, of which this lease covers the N. 50 acres and containing 50 acres, more or less.

It is agreed that this lease shall remain in force for a term of Ten (10) years from this date, and as long thereafter as [fol. 21] oil or gas, or either of them is produced from said land by the lessee.

In consideration of the premises the said lessee covenants and agrees:

1st. To deliver to the credit of lessor, free of cost, in the pipe line to which he may connect his wells, the equal one-eighth part of all oil produced and saved from the leased premises.

2nd. To pay to lessor, as royalty for gas from each well where gas only is found, while the same is being sold or used off of the premises, one-eighth of the market price at the wells of the amount so sold or used, the lessor to have gas free of charge from any gas well on the leased premises for all stoves and inside lights in the principal dwelling house on said land during the time by making lessor's own connections with the well at lessor's own risk and expense.

3rd. To pay to lessor as royalty for gas produced from any oil well and used by lessee for the manufacture of gasoline, one-eighth of the market value of such gas. If such gas is sold by lessee, then lessee agrees to pay lessor, as royalty, one-eighth of the net proceeds derived from the sale of said casinghead gas at the wells.

If no well be commenced on said land on or before the 13th day of January 1932 this lease shall terminate as to both parties, unless the lessee on or before that date shall pay or tender to the lessor, or to the lessor's credit in the First National Bank at Longview, Texas or its successors, which shall continue as the depository, regardless of changes in the ownership of said land, the sum of Fifty ($50.00) dollars, which shall operate as rental and cover the privilege of deferring the commencement of a well for 12 months from said date. In like manner and upon like payments or

tenders the commencement of a well may be further deferred for like periods of the same number of months suc-
[fol. 22] cessively. And it is understood and agreed that the consideration first recited herein, the down payment, covers not only the privilege granted to the date when said first rental is payable as aforesaid, but also the lessee's option of extending that period as aforesaid, and any and all other rights conferred.

Should the first well drilled on the above described land be a dry hole, then and in that event, if a second well is not commenced on said land within twelve months thereafter, this lease shall terminate as to both parties, unless the lessee on or before the expiration of said twelve months shall resume the payment of rentals in the same amount and in the same manner as hereinbefore provided. And it is agreed that upon the resumption of the payment of rentals, as before provided, that the last preceding paragraph hereof, shall continue in force just as though there had been no interruption in the rental payments.

If, at the expiration of 10 years from the date of this lease, oil or gas is not being produced on the leased premises but lessee is then engaged in drilling for oil or gas, then this lease shall continue in force so long as drilling operations are being continuously prosecuted on the leased premises; and drilling operations shall be considered to be continuously prosecuted if not more than sixty (60) days shall elapse between the completion or abandonment of one well and the beginning of operations for the drilling of a subsequent well. If oil or gas shall be discovered and produced in paying quantities from any such well or wells drilled or being drilled at or after the lapse of 10 years, this lease shall continue in force so long as oil or gas shall be produced from the leased premises.

It is specially agreed that in the event that oil or gas is produced from said premises and said production shall for any reason cease or terminate, lessee shall have the right at any time within ninety (90) days from the cessation of
[fol. 23] such production to resume drilling operations in the effort to make said leased premises again produce oil or gas, in which event this lease shall remain in force so long as such operations are continuously prosecuted, as defined in the preceding paragraph, and if they result in production of oil or gas, so long thereafter as oil or gas is produced in paying quantities from the premises.

If said lessor owns a less interest in the above described land than the entire and undivided fee simple estate therein, then the royalties and rentals herein provided for shall be paid the said lessor only in proportion which lessor's interest bears to the whole and undivided fee.

Lessee shall have the right to use, free of cost, gas, oil and water produced on said land for all operations thereon, except from water wells of lessor. When requested by lessor, lessee shall bury pipe line below plow depth. No well shall be drilled nearer than 200 feet to the house or barn now on said premises without the written consent of the lessor. Lessee shall pay for damages caused by all operations to growing crops on said land. Lessee shall have the right at any time to remove all machinery and fixtures placed on said premises, including the right to draw and remove casing.

If the estate of either party hereto is assigned—and the privilege of assigning in whole or in part is expressly allowed—the covenants hereof shall extend to their heirs, executors, administrators, successors, or assigns, but no change in the ownership of the land or assignment of rentals or royalties shall be binding on the lessee until after the lessee has been furnished with a written transfer or assignment, or a certified copy thereof; and it is hereby agreed that in the event this lease shall be assigned as to a part or as to parts of the above described lands and the assignee [fol. 24] or assignees of such part or parts shall fail or make default in the payment of the proportionate part of the rents due from him or them, such default shall not operate to defeat or affect this lease in so far as it covers a part or parts of said lands upon which the said lessee or any assignees thereof shall make due payment of said rental.

Lessee shall have the exclusive right to build, operate and maintain pits, reservoirs, pickup stations and plants for the purpose of picking up and conserving the waste oil that flows down the creeks, ravines and across the land embraces in this lease, whether said oil is produced from lands covered by this lease or other lands, and lessor shall be entitled to receive the royalty hereinbefore reserved on all such oil so saved.

In case of cancellation or termination of this lease for any cause, lessee shall have the right to retain under the terms hereof twenty (20) acres of land around each oil or gas well producing, being worked on, or drilling hereunder (as

long as such operations are continued in good faith) such tract to be designated by lessee in as near a square form as practicable.

In the event lessor considers that lessee has not complied with all its obligations hereunder, both express and implied, before production has been secured or after production has been secured, lessor shall notify lessee in writing, setting out specifically in what respects lessee has breached this contract. Lessee shall then have sixty (60) days after receipt of said notice within which to meet or commence to meet all or any part of the breaches alleged by lessor. The service of said notice shall be precedent to the bringing of any action by lessor on said lease for any cause, and no such action shall be brought until the lapse of sixty (60) days after service of such notice on lessee. Neither the service [fol. 25] of said notice nor the doing of any acts by lessee aimed to meet all or any of the alleged breaches shall be deemed an admission or presumption that lessee has failed to perform all its obligation hereunder.

Title to the minerals vested in grantee under this grant shall not end or revert to grantor until there is a complete, absolute and intentional abandonment by grantee of each and all of the purposes, expressed or implied, of this grant and every part and parcel of the premises described in this grant.

Lessor hereby warrants and agrees to defend the title to the lands herein described and agrees that the lessee shall have the right at any time to redeem for lessor, by payment, any mortgages, taxes, or other liens on the above described lands, in the event of default of payment by lessor, and be subrogated to the rights of the holder thereof.

In testimony whereof, we sign, this — day of ——, 19—.

(Sgd.) B. C. Todd, Attorney-in-fact for C. F. Todd, B. M. Todd, J. W. Todd.

THE STATE OF TEXAS,
County of Tarrant:

Before me the undersigned authority in and for Gregg County, Texas, on this day personally appeared B. Clay Todd, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed, and in the capacity therein stated.

Given under my hand and seal of office this 13th day of January, A. D. 1931.

D. V. Meredith, Jr., Notary Public, Gregg County, Texas. (L. S.)

[fol. 26] EXHIBIT "B" TO COMPLAINT

Railroad Commission of Texas Oil and Gas Division

In re Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Oil and Gas Dockets Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132, & 146

Austin, Texas, May 29, 1934.

Pursuant to notice and hearing Rule No. 37 under Division No. 1, of the amended general conservation rules and regulations of general application in Texas, as promulgated on October 17, 1933, and amended by order promulgated on April 3, 1934, is amended so as hereafter to read as follows:

"Rule 37. Spacing Rule.—No well for oil or gas shall hereafter be drilled nearer than 300 feet to any other completed or drilling well on the same or adjoining tract or farm; and no well shall be drilled nearer than 150 feet to any property line, lease line, or sub-division line; provided that the Commission in order to prevent waste or to prevent the confiscation of property will grant exceptions to permit drilling within shorter distance than above prescribed whenever the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property. When an exception to such rule is desired, application therefor shall be filed with the Commission fully stating the facts, which application shall be accompanied by a plat drawn to the scale of one inch equalling 400 feet, accurately showing to scale the property on which permit is sought to drill a well under an exception to this rule, and accurately showing to scale all other completed, drilling and permitted wells on said property; and accurately showing to scale all adjacent surrounding prop-

erties and wells. Such application shall be verified by some [fol. 27] person acquainted with the facts, stating that all facts therein stated are within the knowledge of the affiant true, and that the accompanying plat is accurately drawn to scale and correctly reflects all pertinent and required data. Such exceptions shall be granted only after at least ten days' notice to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard, and after the Commission has determined that an exception to such rule is necessary either to prevent waste or to protect the property belonging to applicant from confiscation. All pending applications shall be amended to conform to this rule before being acted upon. Upon similar application and showing the Commission may grant exceptions to the application of this rule in fields where the production is obtained from a formation which is known to be segmented by piercement of instrusive salt plugs.

"In the interest of protecting life and property and for other just and reasonable causes the Commission reserves the right in particular fields to enter fields to enter special orders increasing the minimum distances provided by this rule.

"No well drilled in violation of this rule without special permit obtained in the manner prescribed in said rule and no well drilled under such a special permit, which does not conform to the terms of such special permit in all respects shall be permitted to produce either oil or gas and any such well so drilled in violation of said rule or in violation of said rule or in violation of a permit granted under an exception to such rule shall be plugged."

In applying this rule the general order of the Commission with relation to sub-divisions of properties shall be observed.

Railroad Commission of Texas, by Lon A. Smith, Chairman; G. V. Terrell, Commissioner; Ernest O. Thompson, Commissioner.

Attest: C. F. Petet, Secretary. (Seal.)

[fol. 28] EXHIBIT "C" TO COMPLAINT

Railroad Commission of Texas

Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 & 146

In re Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, December 20, 1939.

Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas

Whereas, After due Notice, hearings have been held in Austin, Texas, at various times, including the hearing on December 15, 1939, with respect to the existence and imminence of waste of oil and gas in the State of Texas, and the prevention thereof; and

Whereas, in view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and

Whereas, The Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning 7 a. m., January 1, 1940, until 7 a. m., February 1, 1940; and

Whereas, The Railroad Commission of Texas finds that waste exists and is imminent and that to prevent such waste of oil and gas as the same is defined by the applicable statutes, it is necessary to restrict the production of oil in the State of Texas to the reasonable market demand:

Therefore it is Ordered That beginning at 7. a. m., January 1, 1940, and until 7 a. m., February 1, 1940, the production of oil in the State of Texas and the various fields shown, shall be as hereinafter shown Except as provided for in the Commission's Order of December 20, 1939, entitled "General Order Shutting Down all Oil Wells in the Various Fields and Districts in the State of Texas."

[fol. 29] Rule 2 of Division 2, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Thirty One Thousand Six Hundred Forty Nine (131,649) barrels of crude oil shall be produced from said district during any day of the effective period of this order. Moore County shall not produce in excess of One Thousand Seven Hundred Twenty One (1,721) barrels of oil daily. Moore County allowable is in addition to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of Six Hundred Eleven (611) barrels daily. The Osborne Area Allowable is in addition to the Panhandle allowable.

Rule 23 of Division 3, as contained in an Order of the Commission dated October 17, 1933, pertaining to the East Texas Field as amended by an order of the Commission dated September 11, 1939, is hereby readopted and amended as follows:

Whereas, The Commission finds that in order to prevent waste in said field that the allowable production during the month of January, 1940, should not average more than 450,000 barrels per day over the thirty (30) day period, and that no more than 690,000 barrels of crude oil should be produced from the East Texas field in any one day during the month of January, 1940, and

Whereas, The Commission finds that there exists a market demand for crude oil produced in such an amount in the East Texas Field during the month of January, 1940:

It is Therefore Ordered That Rule 23, of Division 3, of the Commission's order of October 17, 1933, pertaining to the East Texas Field be and it is hereby amended to read, effective January 1, 1940, as follows:

"Rule 23. (A) Not more than 690,000 barrels of crude oil shall be produced from the East Texas Field during any day of the effective period of this Order.

[fol. 30] (b) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) barrels per day.

2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels.

3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of producing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deduction for one (1) and two (2) above have been made, that the product of each well's hourly potential by its bottomhole pressure by the thickness of the saturated Woodbine Sand underlying the well by the average number of acres per well in the lease bears to the sum of such products for all of the wells in the field."

It is Further Ordered That allowable oil in the foregoing order is measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9), and corrected to Sixty (60) degrees Fahrenheit.

It is Further Ordered That this Cause be held open on the Docket for such further orders as may be necessary and supported by evidence of record in the above Cause.

Railroad Commission of Texas, Lon A. Smith, Chairman; Ernest O. Thompson, Commissioner.

Attest: C. F. Petet, Secretary. (Seal.)

[fol. 31] EXHIBIT "C-1" TO COMPLAINT

Railroad Commission of Texas

Oil and Gas Division

Oil and Gas Docket Nos. 100, 120, 123, 124, 125, 126, 128, 129, 132 & 146

In Re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, September 11, 1939.

Special Order Fixing the Allowable Production of Crude Oil in the East Texas Field for the Months of September and October, 1939, and Amending Rule 23, Division 3, of the Commission's Order of October 17, 1933, Pertaining to the East Texas Field

Whereas, The Railroad Commission of Texas, after due notice and hearing on October 17, 1933, promulgated a general order pertaining to the conservation and regulation of crude oil and natural gas for the State of Texas, which included Rule 23 of Division 3, pertaining to the East Texas Field, which provided in part that each oil well in the East Texas Field should be allowed to produce daily a certain maximum percentage of its hourly potential capacity as determined by the Commission, and

Whereas, The Commission through subsequent amendment to Rule 23, of Division 3, of the Order of October 17, 1933, has continued to distribute the allowable for the East Texas Field Between producing wells on the basis set forth in said Rule, and

Whereas, The method of allocation of the allowable production of the East Texas Field has been recently attacked in the courts and the Commission has been restrained from enforcing the provisions of said Rule as it applies to certain properties in the East Texas Field, and

Whereas, The Commission finds that it is necessary to revise the method of allocation and distribution of the allowable oil in the East Texas Field as has been enforced and applied and to amend Rule 23 of Division 3 of the Order of October 17, 1933, in order to conform to certain standards [fol. 32] of distribution of the allowable crude oil porduction between the wells in the East Texas Field as indicated as being necessary by the courts, and

Whereas, The Commission, after due notice, held a hearing in Austin, Texas, called for August 16, 1939, relating to the conservation of crude oil and natural gas in the East Texas Field and the prevention of the waste thereof, at which hearing the Commission heard extensive testimony on the proper factors which should be included in an equitable distribution of the allowable production between the producing wells in the East Texas Field and regulations necessary for the prevention of waste in said Field, and

Whereas, The Commission finds from the evidence submitted at its hearings that in order for each producing well to be allowed to produce its fair share of the allowable oil from the East Texas Field, that the method of allocation and distribution of the Field's allowable between producing wells in this field should, in order to prevent waste, incorporate a minimum well allowable, the potential capacity of the wells on each lease, the number of acre feet of oil

saturated sand underlying the wells on each tract and the bottom-hole pressure of the wells located on each tract, and

Whereas, The Commission finds from evidence submitted to it at numerous Hearings, including the hearing of August 16, 1939, that the reservoir of the East Texas Field has its energy principally supplied by a hydrostatic drive which encroaches from the West to the East and that only a certain amount of crude oil can be withdrawn daily from the East Texas Field in order to utilize effectively the energy necessary to recover the greatest amount of oil ultimately from the reservoir, and

Whereas, The Commission finds that in order to prevent waste in said field that the allowable production during the months of September and October, 1939, should not average more than 490,000 barrels per day over a thirty (30) day [fol. 33] period, and that not more than 690,000 barrels of crude oil should be produced from the East Texas Field in any one day during the months of September and October, 1939, and

Whereas, The Commission finds that there exists a market demand for crude oil produced in such an amount in the East Texas Field during the months of September and October, 1939:

It is Therefore Ordered that Rule 23, of Division 3, of the Commission's Order of October 17, 1933, pertaining to the East Texas Field be and it is hereby amended to Read, effective September 14, 1939 as follows:

"Rule 23. (A) Not more than 690,000 barrels of crude oil shall be produced from the East Texas Field during any day of effective period of this Order.

(B) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) barrels per day.

2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce daily that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels,

3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of producing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deductions for one (1) and two (2) above have been made, that the product of such well's hourly potential by its bottom-hold pressure by the thickness of the saturated Woodbind sand underlying the well by the average number of acres per well in the [fol. 34] lease bears to the sum of such products for all of the wells in the field."

It is Further Ordered by the Railroad Commission that the owner of any oil and/or gas leasehold estate in the East Texas Field shall have the right to present evidence to the Commission and be heard thereon on the question of the amount of acreage owned, the potential of his well or wells thereon, or the bottom-hold pressure of any well or wells on said leasehold estate, or the number of feet of saturated oil sand underlying any of said leases.

It is Further Ordered that this Cause be held open on the docket for such other and further orders as may be necessary and supported by evidence of record.

Railroad Commission of Texas, Lon A. Smith, Chairman; Jerry Sadler, Commissioner. (Seal.)

Attest: C. F. Petet, Secretary.

[File endorsement omitted.]

[fol. 35] IN UNITED STATES DISTRICT COURT

[Title omitted]

ANSWER—Filed February 9, 1940

To Said Honorable Court:

Come now the defendants, the Railroad Commission of Texas, Lon A. Smith, Jerry Sadler, Ernest O. Thompson, Members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, in their official and individual capacities, and for answer to the complaint, say:

I

The complaint fails to state a claim over which this court has jurisdiction.

II

The complaint fails to state a claim against defendants or any of them upon which relief can be granted.

III

Defendants admit the allegations contained in Paragraph I of the complaint.

IV

Defendants deny all the allegations contained in Paragraph II of the complaint.

V

Defendants admit the allegations contained in Paragraph III of the complaint with reference to the assigned allowable, sand thickness, bottom hole pressure, and potentials of each of the seven wells upon the Rowan & Nichols Oil Com- [fol. 36] pany Todd "A" lease. Defendarts say that they are withou' knowledge or information sufficient to form a belief as to the truth of the remaining allegations contained in Paragraph III of the complaint.

VI

(a) Defendants admit that the complainant's lease and the wells producing thereon are located in the East Texas oil field and that said field is water driven, and that on the average the field embraces a territory about forty miles in length and about four miles in width. Defendants deny that one well to ten acres can reasonably drain such area in the East Texas field during the flowing life thereof, and say that the area which can be effectively and efficiently drained by one well in the East Texas field varies from one part of the field to another. Defendants admit that the west side of the field is generally underlain by what is known as bottom water and that generally no water underlies the east half of the field, but defendants say that the water has not encroached regularly and that the extent of encroachment is not uniform. Defendants admit that the East Texas field is now substantially a flowing field, in the sense that a large percentage of the wells in the field are flowing wells and are not pumping wells. Defendants admit that there are approximately 133,000 acres underlain by oil in the East Texas field and that the approxi-

mate average sand thickness of the oil bearing sand is about 40 feet, and that the average sand thickness of the complainant's lease is about 94 feet. Defendants deny that there are approximately 5,586.00 acre feet of oil sand in the entire field. Defendants admit that there are approximately 2655.50 acre feet of oil sand underneath complainant's lease. Defendants admit the allowable production of oil from said field as of December 20, 1939, was approximately 690,000 barrels per producing day, and that from complainant's lease as of December 20, 1939, the allowable production was 260.56 barrels per producing day. [fol. 37] Defendants admit that the average controlled potential of a well in the East Texas oil field is about 605 barrels and that the average controlled potential of the seven wells on complainant's lease is approximately 965 barrels. Defendants admit that the average bottom hole pressure for said seven wells is about 1,115 barrels and that the average sand thickness is about 94 feet. Defendants admit that the approximate average bottom hole pressure for all of the wells in the East Texas field was 1,066.46 pounds as of December 8, 1939. Defendants admit that as of December 20, 1939, there were approximately 26,000 wells producing and authorized to be drilled in the East Texas field, of which number over sixty per cent were allowed as exceptions to Rule 37 under the rules and regulations of the Railroad Commission. Defendants deny that the uncontrolled potentials of wells in the field would run as high as 25,000 to 30,000 barrels per day, but admit that there are some wells in the field which have potentials as low as two or three barrels per day per well. Defendants admit that the complainant's Todd "A" lease is located in the Gladewater nose, which is most favorably situated on the structure and producing horizon of the East Texas field but say that said lease is located nearer to the eastern limit of the field than to the western limit thereof. Defendants admit that the oil saturated sands beneath said lease are approximately of maximum thickness and that there is no danger of encroachment of water at the present time and for a long time to come and that under the present method of proration the wells on said lease can be produced for many months without an excessive gas-oil ratio and with no physical waste. Defendants deny that the Railroad Commission is without authority to restrict the production from complainant's wells upon said lease and say that the

present proration order is a reasonable exercise of the police power of the State of Texas in regulating the production of oil and gas from the East Texas field. Defendants [fol. 38] admit that in general the oil sands to the east of complainant's property are of continually decreasing thickness pinching out to nothing on the eastern edge. Defendants admit that the wells lying to the east of the complainant's property are not capable under the present method of proration of producing as much oil as complainant's wells, and in this connection defendants say that said property will produce only an amount of oil substantially equivalent to the amount of oil originally in place beneath such tract. Defendants further admit that the properties lying to the west of the complainant's property in general will produce for a much shorter period of time than complainant's wells and defendants further say that such wells will produce substantially only the equivalent of the oil originally in place beneath such leases. Defendants say that the present order of the Commission permits the operators in the field as a whole to produce a fair proportion of the oil beneath their tracts and substantially the amount of oil which each producer is entitled to produce.

(b) Defendants say that they are without knowledge or information sufficient to form a belief as to the amount of recoverable oil in place beneath the complainant's lease or the amount of recoverable oil in the entire East Texas field, and in this connection defendants say that such estimates vary considerably between experts and that it is impossible to make a calculation of the recoverable oil in place beneath any tract or beneath the entire field without a considerable chance of error.

VII

(a) Defendants admit such allegations of fact as are contained in subparagraph (a) under Paragraph V in the complaint.

(b) Defendants deny that substantially accurate estimates of the quantities of oil and gas present beneath any particular tract can be made, although defendants admit that certain factors, such as sand thickness, potential prod- [fol. 39] uctivity of wells, bottom hole pressure, and other factors can be estimated with reasonable accuracy. Defendants admit that the Railroad Commission has made a

survey of the East Texas field and knows approximately the sand thickness of each and every well therein, the bottom hole pressure thereof, and the potential of each and every well in said field.

VIII

(a) Defendants admit that under the present orders of the Railroad Commission the complainant is compelled to restrict its production, the order now in effect however being the order dated January 24, 1940, and not the order dated December 20, 1939. Defendants admit that said order of December 20, 1939, was issued and contained substantially the provisions set forth in Paragraph VI (a) in the complaint.

(b) Defendants admit that under the order of December 20, 1939, each well in the East Texas field capable of making 20 barrels of oil per day is allocated a minimum or base allowable of 20 barrels. Defendants deny however that the factors stated in said proration order do not affect the allowable of the wells, and on the contrary say that the factors stated in said proration order affect materially the allowable which is assigned to any well in the field, except marginal wells which are incapable of making 20 barrels of oil per day. Defendants further say that said 20 barrels minimum or base allowable is the amount which has been determined by the Railroad Commission to be the amount below which it is not safe to reduce the production of a well without danger of causing the premature abandonment of many wells and the waste of oil which otherwise would be produced from such wells. Defendants say that as to wells which are incapable of producing 20 barrels per day, the Commission permits said wells to produce all of the oil that said wells are capable of producing, and that under the present order of the Railroad Commission said wells [fol. 40] are not affected by the shutdown order. As to other wells in the field, the twenty barrel base or minimum allowable is in effect reduced over the period during which said order is in effect, by reason of the fact that during twelve days during the month of February, 1940, said wells are prohibited from producing at all by reason of the shutdown order entered by the Railroad Commission of Texas on January 24, 1940. The result of said shutdown order is that the base or minimum allowable is, over the period

of the month of February, 1939, reduced to an average of 11.7 barrels of oil per day, and defendants say that said base or minimum allowable of 11.7 barrels per day is the minimum below which it would not be safe to reduce the allowable production of wells in the East Texas field without grave, serious and immediate danger of causing waste of recoverable oil, the premature abandonment of many oil wells, and the confiscation of the property of the owners of such wells.

(c) Defendants deny specifically that the application of the base or minimum allowable of twenty barrels per day has the effect of depriving the complainant of its fair share of the daily allowable for the field or denies to it equal protection of the law or results in the taking of its property without due process of law.

(d) Defendants deny that the complainant is suffering any drainage from its lease or that it has suffered any drainage in the past and defendants say that on the contrary the complainant has drained from other leases to its lease substantially the equivalent of the total amount of oil which has been produced to date from the seven wells upon complainant's lease. Defendants further say that complainant's lease is now underlain by substantially the same amount of oil as was originally in place beneath said lease at the time of the beginning of production from the East Texas Field. Defendants say that the complainant is not losing any of its present daily allowable, but is pro lucing and saving all [fol. 41] of its present daily allowable, that it is now suffering no loss whatsoever and that there is no reasonable probability that it will suffer any loss in the future.

(e) Defendants deny that the complainant is entitled to produce any oil in addition to its present allowable and specifically deny that complainant is entitled to produce sixty per cent more oil from its Todd "A" lease than it is now allowed to produce under the rules and regulations as enforced and applied by the Commission.

(f) Defendants deny all of the allegations contained in Paragraph VI (f) of the complaint.

(g) Defendants admit that the Railroad Commission of Texas has refused to reduce the base or minimum allowable for wells in the field to five barrels per day or less, and

defendants say that said base or minimum allowable as it now exists, which is equal to an average of 11.7 barrels per day, is a reasonable base or minimum allowable, and cannot be reduced without causing serious, grave and immediate danger of the premature abandonment of a large number of wells and the loss and waste of a large amount of recoverable oil and the confiscation of the property of the owners of a large number of wells in the East Texas field.

IX

(a) Defendants deny all of the allegations in Paragraph VII (a) of the complaint.

(b) Defendants deny all of the allegations contained in Paragraph VII (b) of the complaint.

X

(a) Defendants admit that a permit was granted to R. M. Wood by the Railroad Commission of Texas to drill a well on a strip of land several hundred feet south of the respondent's Todd "A" lease, but defendants say that said tract of land contains one acre of land and not one-tenth of an [fol. 42] acre as alleged by the complainant. Defendants further admit that since August 22, 1937, the said Wood has produced from his said tract an average of about twenty-three barrels per day, but defendants say that the said R. M. Wood has not produced to date and will not produce for several years an amount equivalent to the oil orginally in place beneath said tract. Defendants deny that the said R. M. Wood well has drained any oil from the complainant's Todd "A" lease or has injured the complainant in any way whatsoever. Defendants deny all other allegations contained in Paragraph VIII (a) of the complaint.

(b) Defendants admit that there are wells drilled in the East Texas field to as low a density as one well to one acre, but defendants say that the average density of drilling in the East Texas field is now about one well to 5.2 acres, whereas the average density of drilling of the complainant's Todd "A" lease is one well to 4.03 acres, and that complainant's lease is therefore more densely drilled than the average of the field. Defendants further say that said lease of complainant is in a part of the field where water has not encroached and that complainant's lease now has under-

neath it the same amount of oil as was originally in place beneath said lease. Defendants deny that any of the tracts which have been densely drilled have drained any oil from the complainant's lease or that said wells have dissipated any producing energy from the complainant's land. Defendants deny that there has been any decrease in the oil beneath complainant's land, in spite of the fact that complainant has produced from said lease a large amount of oil and deny that the oil beneath the complainant's lease, in spite of the continuous production from said lease, will decrease to any material extent for many months to come. Defendants deny that complainant will lose oil to which it is entitled to any other producers anywhere in the East Texas field. Defendants say that long before complainant's lease is drowned out by water, complainant will have pro- [fol. 43] duced from its lease at least the equivalent of the recoverable oil originally in place beneath said lease. Defendants deny that the proration order attacked by the complainant is discriminatory, confiscatory, oppressive or inequitable.

XI

Defendants admit that the complainant is entitled to produce an amount of oil substantially equivalent to the oil originally in place beneath its lease, provided it uses due diligence in developing and producing its lease, and provided such production does not conflict with the public welfare or with legal rights of other persons, and defendants say that the present order of the Railroad Commission, attacked by the complainant in this case, permits the complainant to produce all of the oil which it is legally entitled to produce.

XII

(a) Defendants deny the allegations contained in Paragraph X(a) of the complaint.

(b) Defendants deny the allegations contained in Paragraph X(b) of the complaint.

XIII

(a) Defendants admit that an application was filed as alleged in Paragraph XI(a) of the complaint, and that the Railroad Commission has not granted said application.

(b) Defendants admit that the complainant and others have protested against the 20 barrel minimum allowable, but defendants deny that said allowable is arbitrary, capricious, unreasonable, without color of authority or without basis in fact or in law, and say that said order on the contrary is reasonable, lawful and proper.

XIV

Defendants deny the allegations contained in Paragraph XII of the complaint.

[fol. 44]

XV

Defendants say that they are without knowledge or information sufficient to form a belief as to the truth of the allegations contained in Paragraph XIII of the complaint.

XVI

Defendants deny the allegations contained in Paragraph XIV of the complaint.

XVII

(a) Defendants deny the allegations contained in subparagraph XV (a) of the complaint.

(b) Defendants deny the allegations contained in subparagraph XV (b) of the complaint. In this connection defendants say that the Railroad Commission permits marginal wells, that is, wells which are incapable of producing as much as twenty barrels per day in the East Texas field to produce to their full capacity, and that the base or minimum allowable assigned to other wells, which averages 11.7 barrels per day during the month of February, 1940, considering the shutdown days, is not controlled by the marginal well statute, Article 6049b, but by the finding of the Railroad Commission of Texas that such base or minimum allowable is necessary in order to prevent the premature abandonment of a large number of wells in the East Texas field and the waste and confiscation of property which would result from such abandonment. Defendants deny that said base or minimum allowable is unreasonable or that said base or minimum allowable would deprive the complainant of any of its property or damage it in any way whatsoever. Defendants deny that the marginal well statute has been repealed by any subsequent legislation and say that said statute is now in full force and effect.

XVIII

Defendants deny all of the allegations contained in Paragraph XVI of the complaint.

[fol. 45] Premises considered, defendants pray that all relief be denied to the complainant and that defendants go hence with their costs without day, and for such other and further relief as shall be proper in the premises.

Gerald C. Mann, Attorney General of Texas; James P. Hart, Assistant Attorney General; Tom D. Rowell, Jr., Assistant Attorney General; Edgar Cale, Assistant Attorney General. E. R. Simmons, Jr., Assistant Attorney General; Austin, Texas. Attorneys for Defendants.

Acknowledgment of Service

Service of the foregoing answer by delivery of a copy thereof to the undersigned is acknowledged this 8th day of February, 1940.

Dan Moody, Attorney for Complainant.

[File endorsement omitted.]

[fol. 46] In United States District Court

[Title omitted]

Supplemental Complaint—Filed Feb. 12, 1940

To the Honorable Judges of Said Court:

Comes now Complainant Rowan & Nichols Oil Company further complaining of Lon A. Smith, Jerry Sadler and Ernest O. Thompson, who compose the Railroad Commission of Texas, and of Gerald C. Mann, who is the Attorney General of Texas, and, with leave of the Court first had and obtained, files this First Supplemental Bill of Complaint, amending and supplementing in the particulars shown Complainant's Original Bill of Complaint and answering Respondents' Original Answer, and for such says:

I

Complainant amends that part of paragraph IV of its Original Bill of Complaint wherein it is alleged that there

are approximately 5,586.00 acre feet of oil sand in the entire field and 2,655.50 acre feet of oil sand under Complainant's lease, to read as follows: There are approximately 4,990,-350 acre feet of oil sand in the entire field and 2,655.50 acre feet of oil sand under Complainant's lease.

II

Complainant amends sub-paragraph (d) of paragraph VI of Complainant's Original Bill of Complaint to read as follows:

[fol. 47] (d) The application and enforcement of said order operates to deny to Complainant an equal opportunity with others in said field in the production of oil, and results in drainage of Complainant's Todd "A" lease, and in a denial to Complainant of the equal protection of the law and in the taking of Complainant's property without due process of law, and in a loss to Complainant daily of an amount of oil equal to more than sixty per cent (60%) of its present daily allowable, which oil at this time is of the reasonable market value of $1.10 per barrel in said field.

III

(a) Since the filing of Complainant's Original Bill of Complainant, Respondents have promulgated and are now enforcing a new order prorating among wells in the field the amount of oil which the East Texas field is allowed to produce under the orders of the Railroad Commission; said new order was dated January 24, 1940, and was promulgated on or about that date to be effective February 1, 1940, and for the month of February, and said order has since February 1, 1940, been enforced against Complainant to control production of oil from Complainant's Todd "A" lease; that by said order the field allowable for the East Texas field is continued at 690,000 barrels of oil per day and said field allowable is by the terms of said new order allocated among wells in the field on the same plan and basis as was provided in the order of December 20, 1939, set forth in paragraph VI of Complainant's Original Bill of Complaint and in "Exhibit C" attached to Complainant's Original Bill of Complaint; that said order of January 24, 1940, continues the practice of arbitrarily giving to each well in the field capable of making as much as 20 barrels of oil per day a base or minimum allowable of 20 barrels per day, without

regard to the capacity of such wells to produce in excess of 20 barrels per day, and without regard to the area of the lease or the density of drilling on the lease upon which such well or wells are located; that said order of January 24, [fol. 48] 1940, continues the practice of arbitrarily allowing each well that cannot be made to produce as much as 20 barrels per day to produce to its maximum capacity; and said order further provides that the field shall be closed in on Wednesday, Saturday and Sunday of each week during the effective term of said order; that on January 24, 1940, the Railroad Commission promulgated a further and additional order amending the above mentioned order of January 24, 1940, regulating the production of oil in the East Texas field and by the terms of said order it is provided, in effect, that any pumping well in the East Texas field which has a daily productive capacity of only 20 barrels or less, averaged over the preceding thirty consecutive days, shall be allowed to produce daily (including Wednesdays, Saturdays and Sundays) an amount of oil up to and including 20 barrels per day. The effect of said two orders of January 24, 1940, is to continue the plan provided by said order of December 20, 1939, for the proration of the East Texas field, except that under the order of December 20, 1930, all wells were closed in for certain days of the month, while under the two orders of January 24, 1940, all wells, except those capable of producing only 20 barrels or less, averaged over the preceding thirty consecutive days, are closed in on Wednesday, Saturday and Sunday of each week during the effective term of said order, while such wells as are capable of producing 20 barrels or less are allowed to produce to their maximum capacity each day of the week.

(b) That it is the purpose, plan and intention of the Railroad Commission, frequently and publicly declared, to continue in force, from month to month, the plan of proration provided in said order of December 20, 1930, and in said orders of January 24, 1940, as said orders regulate and control the allocation of the daily field allowable among wells in the East Texas field, except that members of the Railroad Commission have publicly stated that it is the purpose of [fol. 49] the Railroad Commission to rescind the two orders of January 24, 1940, and promulgate a new order in terms identical with the order of December 20, 1939, though no official action so far as Complainant is informed has been

taken by the Railroad Commission to rescind the orders of January 24, 1940, and promulgate a new order identical with the order of December 20, 1939. In this connection Complainant alleges that it is the purpose and plan of the Railroad Commission to continue from month to month the plan of proration provided by the order of December 20, 1939, except as it may be modified by the above mentioned orders of January 24, 1940, and this suit is directed against both the order of December 20, 1939, and the two orders of January 24, 1940, and all other orders that may hereafter be promulgated by the Railroad Commission controlling production from wells in the East Texas field on the basis, or substantially the same basis, as that provided in said orders of December 20, 1939, and January 24, 1940.

IV.

(a) Complainant alleges that the orders of January 24, 1940, are now being enforced against it to control production of oil from its Todd "A" lease and said orders of January 24, 1940, are enforced and applied to control production from Complainant's Todd "A" lease in the same manner as Complainant alleges in its Original Bill of Complaint the order of December 20, 1939, was being enforced and applied, except as to the number of shutdown days, and except as to the allowing of all wells that cannot produce more than 20 barrels of oil per day to produce on days when other wells in the field, including Complainant's wells, are not allowed to produce. By allowing certain wells in the field to produce every day, although Complainant's wells are required to be shut in for three days during the week, Complainant is injured and damaged to a greater extent than the injury and damage alleged by Complainant as being suffered by it under the enforcement of the order of December 20, 1939. Each and all of said orders, as so enforced and applied to control production from Complain-
[fol. 50] ant's lease, operate to presently deprive Complainant unnecessarily of an equal opportunity with others in the production of oil from the common reservoir and operate presently to cause the drainage of oil from Complainant's lease to the properties of other persons, and operate presently to deny Complainant the right to produce oil from its leasehold in the proportion that its reserves bear to the total reserves in the field, and operate presently to deny Complainant an opportunity along with other operators in

the field to produce its fair share of the daily allowable, and further presently deprive Complainant of the benefits of the favorable location of its lease on the structure from which oil is produced in the East Texas field; and if said orders, or similar plans of proration, are continued in force, their effect will be to deprive the Complainant of an opportunity to recover from its leasehold during the productive life of the field anything like substantially the amount of recoverable oil originally or now in place under its said lease, while other operators in said field will be allowed to produce many times the amount of oil either originally or now in place under their respective leaseholds; and thus by the enforcement of said orders, the Complainant's property is presently taken, and, so long as such plan of proration, or a similar plan of proration, is enforced, the Complainant's property will be taken to enrich others, and such taking is without due process of law and is in the denial to the Complainant of the equal protection of law, contrary to the due process and equal protection clauses of the Fourteenth Amendment to the Constitution of the United States.

(b) That such system of proration and such taking of the Complainant's property are not necessary to prevent waste of oil and are not accomplished by a lawful exercise of the police power of the State.

[fol. 51]

V

That Chapter 97, Acts of the Regular Session of the Forty-third Legislature (Article 6049b, Vernon's Texas Civil Statutes, Annotated, commonly referred to as the "marginal well law"), as applied to the East Texas field defines a "marginal well" to be a pumping well, capable of producing 20 barrels or less of oil per day, averaged over the preceding thirty consecutive days, that would be damaged or caused to be prematurely abandoned by artific-ally restricting its production or as to which artificial restriction of production would result in loss of oil ultimately recoverable. Said statute does not restrict the power of the Railroad Commission to artificially control the production of any wells, except wells which are within the term "marginal well" as so defined in the statute. There are not in the East Texas field any wells that come within the term "marginal well" as that term is defined by said statute, and,

repeatedly and consistently, over a long period of years, the Railroad Commission has so found the facts, as is evidenced by the methods employed by the Railroad Commission in regulating production of oil in the East Texas field. That if methods employed by the Railroad Commission in regulating production of oil in the East Texas field do not amount to a finding by the Railroad Commission that there are not in the East Texas field any wells included within the term "marginal well", as the term is defined by said statute, then such course of conduct over a long period of years on the part of the Railroad Commission amounts to a consistent, uniform and continuous construction by the Railroad Commission of said statute as empowering the Railroad Commission to restrict the production of said so-called "marginal wells" in the East Texas field to less than 20 barrels of oil per day. In either event, the action of the Railroad Commission in allowing all wells in the East Texas field which are incapable of making more than 20 barrels of [fol. 52] oil per day to produce to the maximum of their capacity is inconsistent with the former long established and continuously pursued policy of the Railroad Commission and is arbitrary and capricious.

VI

Complainant denies that an allowance of 20 barrels of oil per day as a minimum or base allowable to each well in the East Texas field capable of producing that amount or more of oil per day is necessary to prevent the premature abandonment of wells or the waste of oil which would otherwise be produced from the field or to prevent the confiscation of property, and in this connection say that the wells in the East Texas field can be produced on a daily allowable of 5 barrels, or even less, of oil per day at a profit to the operators and without waste and without damaging the wells and without causing premature abandonment of the wells and without causing loss of oil ultimately recoverable from the field. If the Railroad Commission has by its order of December 20, 1939, or by its orders of January 24, 1940, construed the "marginal well" statute to prohibit the Railroad Commission restricting the production of flowing wells below 20 barrels of oil per day, or as requiring the Railroad Commission to allow to all wells in the field capable of making 20 barrels, or more, of oil per day a minimum allowable

of 20 barrels of oil per day, then the statute, so construed, is unconstitutional and void, because in conflict with the due process clause and the equal protection clause of the Fourteenth Amendment to the Constitution of the United States, in that, so construed, it operates to unreasonably and unnecessarily favor one operator over another in allowing operators of wells on small tracts and densely drilled tracts a greater opportunity to recover oil from the common reservoir than is allowed operators of wells on larger tracts and less densely drilled leases, and takes the property of this Complainant, and others in like situation, and bestows it upon others.

[fol. 53] Wherefore, Complainant prays for the relief prayed for in Complainant's Original Bill of Complaint.

(S.) Dan Moody, (S.) Rice Tilley, Attorneys for Complainant.

Duly sworn to by A. H. Rowan. Jurat omitted in printing.

[File endorsement omitted.]

[fol. 54] IN UNITED STATES DISTRICT COURT

[Title omitted]

ANSWER TO SUPPLEMENTAL COMPLAINT—Filed February 13, 1940

To Said Honorable Court:

For answer to the supplemental complaint, defendants say:

I

Defendants deny that the total number of acre feet of oil sand in the entire field is approximately 4,990,350, and defendants say that the said total number of acre feet of oil sand in the entire field is substantially more than said figure. Defendants admit that the approximate number of acre feet of oil sand under plaintiff's lease is 2,655.50 acre feet.

II

Defendants deny all of the allegations contained in subparagraph (d) of Paragraph VI of the complaint, as amended by Paragraph II of the supplemental complaint.

III

(a) Defendants admit that the Railroad Commission on January 24, 1940, promulgated a new order, to be effective February 1, 1940, for the month of February, 1940, and that said order has been enforced against the plaintiff, and that the total field allowable under said order is continued at approximately 690,000 barrels of oil per day on the days on which the wells in the field are allowed to produce. Defendants admit that the said order of January 24, 1940, is en- [fol. 55] forced substantially in the same manner as the order of December 20, 1939, except that under the order of January 24, 1940, and the marginal well exemption order of January 24, 1940, all marginal wells, that is, wells which are incapable of making more than twenty barrels per day, are exempted from the twelve shutdown days which are applied to all other wells in the East Texas field. Defendants admit that under the order of January 24, 1940, each well in the field capable of making more than twenty barrels of oil per day is assigned a base or minimum allowable of twenty barrels per day, but defendants deny that said minimum allowable is arbitrary and say that said minimum allowable is reasonable and is required in order to prevent the premature abandonment of wells and waste and confiscation of property. Defendants say that the marginal wells which are permitted to produce each day in the month of February, consist of only about 550 wells and that said marginal wells are wells located on the edges of the field where the productive life of such wells is comparatively short.

(b) Defendants admit that it is the purpose, plan and intention of the Railroad Commission, unless enjoined therefrom by this Honorable Court, to continue in force substantially the same plan of proration for the East Texas field as is provided in said orders of January 24, 1940. Defendants deny that there have been any statements of intention on the part of the Railroad Commission of Texas to rescind the orders of January 24, 1940, as applied to the East Texas field.

IV

(a) Defendants admit that the order of January 24, 1940, is being enforced against the plaintiff's lease. Defendants deny that by permitting the marginal wells to operate every day in the week, the Railroad Commission is permitting any injury or damage to the plaintiff's lease, but say that the [fol. 56] marginal wells are wells located on the edges of the field, and are few in number, and have no effect whatever upon the amount of oil which will be recovered by the plaintiff from its lease. Defendants deny that the present orders of the Railroad Commission are arbitrary or deprive the plaintiff of its property with due process, and defendants affirmatively aver that the plaintiff will recover during the producing life of its lease at lease an amount of oil substantially equivalent to the amount of recoverable oil originally underlying said lease. Defendants deny all of the remaining allegations in Paragraph IV (a), except such allegations as have been hereinbefore specifically admitted.

(b) Defendants deny the allegations contained in subparagraph (b) of Paragraph IV of the supplemental complaint.

V

Defendants say that under the provisions of the marginal well statute, Article 6049b of the Revised Civil Statutes, as amended, the Railroad Commission of Texas is prohibited from restricting the production from wells within certain classifications as to depth, set forth in said statute. Defendants say that as applied to the East Texas field, said statute prohibits the Railroad Commission from curtailing the production of pumping wells which are incapable of producing more than twenty barrels of oil per day. Defendants deny that there has been any finding by the Railroad Commission of Texas that said marginal wells do not come within the definition of the statute. Defendants further deny that by failing to apply the shutdown order to said wells, the Railroad Commission has acted arbitrarily or capriciously, and defendants say that said action of the Railroad Commission is required by the provisions of said statute, which withholds from the Railroad Commission the power to cur- [fol. 57] tail the production of said wells. Defendants say that the marginal wells in the East Texas field amount to only a small percentage of the wells in said field, that said

marginal wells are located on the edges of the field, that the production from said wells is relatively small, that the productive life of said wells is short, and that the oil produced by said wells would not be produced by any other wells in the field, and that the production from said wells does not affect in any manner the production of oil from the plaintiff's lease.

VI

Defendants deny all of the allegations contained in Paragraph VI of the supplemental complaint.

Wherefore, defendants pray that all relief be denied to the plaintiff, that defendants go hence with their costs, and for such other and further relief as shall be proper in the premises.

(S.) Gerald C. Mann, Attorney General of Texas; James P. Hart, Assistant Attorney General; Tom D. Rowell, Jr., Assistant Attorney General; Edgar Cale, Assistant Attorney General; E. R. Simmons, Assistant Attorney General, Attorneys for Defendants, Austin, Texas.

Duly sworn to by F. V. L. Patten. Jurat omitted in printing.

[fols. 58-63] [File endorsement omitted.]

[fol. 64] IN UNITED STATES DISTRICT COURT IN AND FOR THE WESTERN DISTRICT OF TEXAS

No. 46 Civil

ROWAN & NICHOLS OIL CO.

vs.

RAILROAD COMMISSION OF TEXAS, et al.

Statement of Evidence—Filed April 10, 1940

Be It Remembered that on this Tuesday, February 13th, 1940, the above entitled and numbered cause came on for trial before the Honorable Samuel H. Sibley, United States Circuit Judge, Fifth Circuit, Honorable Robert J. McMil-

lan, United States District Judge, Western District of Texas, and Honorable James V. Allred, United States District Judge, Southern District of Texas, at Austin, Texas, and continued from day to day to its conclusion; plaintiff being represented by Mr. Dan Moody, of Austin, Texas, and Mr. Rice M. Tilley, of Fort Worth, Texas; and the defendants being represented by Mr. James P. Hart, Mr. E. R. Simmons, and Mr. Edgar Cale, Assistant Attorney Generals, of Austin, Texas; and during said trial the following testimony was introduced and proceedings had in connection therewith:

[fol. 65] PRELIMINARY DISCUSSION

Judge Sibley: Gentlemen, there seem to be five cases for this Three Judge Court to deal with. I understand that possibly three of them can be handled together. I will inquire about that first; they are the cases of Humble Oil & Refining Company against the Railroad Commission, F. W. Fischer vs. Lon A. Smith and others, and the other is the Rowan & Nichols Oil Company vs. the Railroad Commission. Are they all ready, first?

Mr. Hart: If the Court please, we represent the defendants in all of those cases—the Attorney General and the Railroad Commission, and I might state on behalf of the defendants in all three of those cases that we are willing to agree to the suggestion made yesterday by Judge McMillan that a joint trial be had of all three cases.

Judge Sibley: Now, you don't wish to consolidate them, but you wish to try them together, and let separate judgments be entered in them, I suppose.

Mr. Hart: Yes, sir, that is correct. All evidence introduced, as I understand it, can be used for or against all of the parties, unless it is specially limited at the time it is introduced.

Judge Sibley: What do the plaintiffs say about that?

Mr. Baker: Your Honor, we represent the Humble and we have no objection to hearing the three cases all along together, but I raised the point yesterday whether or not one of the plaintiffs would have any right to question the witnesses of any other plaintiff inasmuch as there is no controversy, as I understand it, between the several parties; otherwise, why, the cases could be carried along right together.

[fol. 66] Judge Sibley: Well, what say the representatives of the other two parties?

Mr. Fischer: I happen to be one of the plaintiffs that Mr. Baker is talking about. Now, it is agreeable with me to try my case along with the Rowan & Nichols and the Humble; I think it ought to be tried that way, because the evidence offered by one will be applicable to the contention of all of us in many respects; but I think if a witness for the Humble or Rowan & Nichols has testified to some matters that I desire a little elucidation upon that point, that I am entitled to ask him a question.

Judge Sibley: I think that is undoubtedly true, sir.

Mr. Fischer: Yes, sir, it is agreeable to me.

Mr. Moody: It is agreeable with Rowan & Nichols to try its case along with the other two cases. I have no knowledge as to what amount of testimony the Humble Oil Company, for example, will want to introduce, or Mr. Fischer; and, obviously, I take it there is a lot of the testimony that Mr. Fischer might introduce that would be immaterial and irrelevant so far as any questions involved in the Rowan-Nichols case are concerned. I don't know—so far as testimony that bears on the general nature or conditions of the East Texas Field, I think the testimony that Mr. Fischer might introduce or that the Humble might introduce or that the State might introduce would be substantially the same testimony as Rowan & Nichols would introduce; but there—the Humble owns quite a large acreage in the East Texas Field, and Mr. Fischer owns quite a number of tracts in the East Texas Field and Rowan & Nichols has only one [fol. 67] tract of land of twenty-eight acres involved in this case.

Judge Sibley: Do you expect to use oral testimony?

Mr. Moody: Yes, sir, we are pressing our application for an interlocutory injunction and we will introduce some testimony. We would like the privilege of indicating to the Court after the Humble Company has completed the introduction of its testimony that we want the testimony of witnesses A and B and exhibits so and so considered, in connection with the Rowan & Nichols case, and while we will be having a joint trial and not a consolidation——

Judge Sibley: Well, we could hear the Humble-Nichols testimony first and then let you supplement it if you so desire.

Mr. Moody: Yes, sir.

Judge McMillan: Governor Moody, are you going to press your case for final judgment?

Mr. Moody: Yes, sir. We are going to press our case for interlocutory injunction.

Judge McMillan: Is that true in the Rowan-Nichols case?

Mr. Moody: Yes, sir, it is.

Judge McMillan: You retain the application for interlocutory injunction so as to hold the three Judges?

Mr. Moody: Yes, sir.

Judge McMillan: But want the case finally settled, too?

Mr. Moody: Yes, sir; yes, sir.

Mr. Hart: Now, there may be a great deal of evidence introduced by the Humble Company, for example, with reference to the general conditions in the field or other [fol. 68] evidence that we believe would be relevant to the Rowan-Nichols case. Now, are we going to have to get up and make a statement——

Judge Sibley: My understanding was that all of the evidence offered would be considered as available in all three cases, but in making up a record of appeal it might be decided to eliminate some evidence as having no connection with some particular case.

Mr. Hart: I see, but for the purpose of this trial, it will be considered that any evidence introduced by any party may be considered as relevant for or against any other party.

Judge Sibley: That is my understanding. Is that right?

Mr. Moody: That is my understanding, Your Honor, I thought the Humble, being the oldest case, it would proceed to introduce its testimony first. I just presumed that to be the case. Now my understanding of the matter is, and I may be in error about it, that the Humble has got a large—well, I know the Humble has a large acreage in the field and would like to introduce testimony about various leases that are far removed and have no relation to the Rowan-Nichols case. So far as the Rowan-Nichols case is concerned, I don't think we will have a great deal of testimony, and I thought——

Judge Allred: Your opponent is the Commission, of course?

Mr. Moody: Yes, sir.

Judge Allred: And when you come to present your case, [fol. 69] there is a great mass of it that you don't wish considered in the case and will——

Mr. Moody: Yes, sir.

Judge Allred: —say so, and if the Commission wants to put in any they can do it.

Mr. Moody: Yes, sir, that is satisfactory.

Mr. Baker: I would like to call the Court's attention to this matter, as I understand his pleadings, Mr. Fischer's case is rested upon an entirely different principle from that upon which the Humble and Rowan & Nichols rest their case, and, therefore, we would not wish to be bound by the evidence that Mr. Fischer introduces; in other words, we don't want to make that our evidence. I would like to make that clear, if you please.

Judge Sibley: All right. Now, you see, gentlemen, we will be pressed for time and so we will try to get along as best we can. You may proceed now for the Humble Company.

[fol. 70] **Plaintiff's Evidence**

I. L. Sorenson, a witness produced by the Plaintiff, having been first duly sworn, testified as follows:

Direct examination.

Questions by Mr. Baker:

Q. Please state your name.
A. I. L. Sorenson.
Q. Where do you live?
A. Houston.
Q. What is your occupation?
A. Geologist.
Q. What is your employment at this time?
A. Employed by the Humble Oil & Refining Company.
Q. As a geologist?
A. Yes, sir.
Q. Will you give your educational qualifications, please?
A. I have a B. A. degree from the University of Iowa, with a Major in geology.
Q. Do you belong to any geological society?
A. The American Association of Petroleum Geologists.
Q. How long have you been employed as a geologist by Humble Oil & Refining Company?
A. Since 1925.
Q. What is the nature of your geological experience?
A. I have had geological experience in the various fields of Arkansas, Louisiana, and Texas.

Q. Have you made a study in particular of the East Texas Field?

[fol. 71] A. Yes, sir. I served as production geologist in East Texas for the Humble from February, 1931, until January 1, 1939.

Q. While you were doing that work, did you study conditions in the field?

A. Yes, sir.

Q. In what way did you study conditions in the field?

A. The drilling of our properties in the field, and properties adjacent to us throughout the entire East Texas field.

Q. Do you mean to say you have kept up with the drilling operations on the Humble Properties and on adjacent property?

A. Drilling and development on all of our properties in the field.

Q. Just what was the nature of your duties?

A. To assist the production department in the drilling of wells, completing of wells, depth of penetration of the sand, casing points, tubing points, and production methods.

Q. Did you inform yourself concerning the producing sands and the producing sand section?

A. Yes, sir.

Q. How did you do that?

A. By coring the sand, by drillers logs, by cuttings, and by electrical logs.

Q. Did you study the water conditions in the field?

A. Yes, sir.

Q. Did you make a study of the character of the oil in the sands and its habits?

A. Yes, sir.

Q. Did you study the general reservoir conditions in the field?

A. Yes, sir.

Q. I will ask you whether you have had access to practically all of the data that Humble Oil & Refining Company [fol. 72] has relating to the East Texas Field, geologic data?

A. Yes, sir.

Q. Did you study that data?

A. Yes, sir.

Q. You feel you are thoroughly familiar with the East Texas Field do you or not?

A. Yes, sir.

Mr. Baker: Your Honor, at this point we would like to introduce several exhibits. The first exhibit that I would like to introduce is a very large map of the East Texas Field. This, I suppose, will be marked Humble's Exhibit No. 1. It is drawn to a scale of one inch to one thousand feet. It is in three sections, but I introduce this map for the purpose of showing the extent of the field, the location of the Humble's properties, these properties being shaded in yellow, and the distribution of those properties throughout the field, and particularly to show also the densities, the varying densities to which the field has been drilled.

Judge Sibley: Did this man make it, or who vouches for it?

By Mr. Baker:

Q. How was this map compiled?

A. Compiled by our engineering department in conjunction with our geological department.

Q. You are familiar with the map?

A. Yes, sir.

Q. Can you state it fairly represents conditions in the field?

A. Yes, sir.

Q. This map, of course, will show the varying densities there at a glance.

[fol. 73] Judge Sibley: Any objection to the map, gentlemen?

Mr. Hart: The Commission has no objection to the map.

Judge Sibley: Well, the map is in. I think you have got the substance on these pictures.

Mr. Baker: Yes, sir.

Judge Sibley: We will look at the pictures for the present. That is in the record.

(Thereupon said map was admitted in evidence as Humble's Exhibit No. 1.)

By Mr. Baker:

Q. All right, the next exhibit plaintiff wishes to introduce is this map here styled "Index Map", and we introduce that as Plaintiff's Exhibit No. 2.

(Thereupon said map was admitted in evidence as Humble's Exhibit No. 2.)

By Mr. Baker:

Q. Mr. Sorenson, would you mind stepping over here, please, and explaining this map to the Court?

Judge Sibley: Did you make it, Mr. Sorenson?

A. No, sir, this is a reduction of a 1,000 foot map. This is a map of the East Texas field on the scale of one inch to three thousand feet, and shows the outlines of the field, the producing areas, the location of the wells, and the Humble leases shaded in yellow. It is divided into three parts, the usual division of the field, Henderson District, the Kilgore District, and the part North of the river, the Longview District.

Q. That is extending from North to South. You have some lines here marked "AA", "BB", "CC", and so forth. Will you state the significance of those lines?

A. They represent the course of the cross sections drawn across the producing horizon.

[fol. 74] Q. Those cross sections that will be introduced as Exhibit 5, perhaps?

A. Yes, sir.

Q. At least an exhibit that we will soon introduce that indicates the various locations of those cross sections?

A. Yes, sir.

Q. Is there one running North and South?

A. There is also a North-South cross section extending through the center of the field from the North end to the South end.

Mr. Baker: We wish to introduce another map of the East Texas field, which would be Exhibit No. 3, and it is named here "Contour, East Texas field, Contoured on Top of Woodbine sand".

(Thereupon said map was admitted in evidence as Humble's Exhibit No. 3.)

Q. Will you explain this map please?

A. This map is contoured on the top of the woodbine sand on 40 foot contours.

Q. What does it show with respect to the field?

A. It shows the structure position of the top of the sand.

Q. Does it also show the outlines of the field, and the location of wells and the location of the Plaintiff's properties?

A. Yes, sir.

Q. Does it show anything else? That is about what is shows, is it?

A. That is what it shows.

Mr. Baker: We wish to introduce another map which is—has already been introduced in evidence by the Commission. I have forgotten the exhibit number.

[fol. 75] Judge Sibley: Let's give it a new number for this trial, because this applies to another case also.

Mr. Baker: This is an isopach map of the East Texas field, or a sand thickness map that was introduce- by the Railroad Commission in the Houston hearing, was it not?

Mr. Hart: I don't recall whether it was introduced or not. I don't think I will have any objection to you introducing it. I think it was introduced in Houston at the hearing there.

Mr. Baker: Mr. Sorenson, will you——

Mr. Moody: What number are you giving that?

Mr. Baker: It is the Commission's Exhibit 1, but we could identify it as our Exhibit No. 4.

Mr. Hart: We haven't offered it at this hearing yet. Are you offering it?

Mr. Baker: Yes, sir, we offer it, if you don't.

(Thereupon said map was admitted in evidence as Humble's Exhibit No. 4.)

Q. Will you explain that?

A. This isopach map also shows an outline of the field, the location of the wells and leases, and is contoured on the thickness of the sand, the net effective sand throughout the field.

Q. That doesn't purport to show the entire oil bearing section, but the net effective oil sand; is that it?

A. Yes, sir.

Q. What interval is it contoured on?

A. Ten feet.

Q. Will you state what interval is allowed to the contour that embraces the edges of the field?

[fol. 76] A. All wells falling within the limits of the ten foot contour are allowed ten feet.

Q. Indicated as having ten feet. Do they actually have ten feet?

A. No, sir, the maximum would be ten feet down to zero.

Q. What would the average property be?

A. 5 feet.

Q. Approximately 5 feet. In that respect, the contour map, does it or not represent the actual conditions with respect to sand thickness in the field?

A. It represents actual conditions except for that peripheral maximum where ten feet is granted.

Q. If you were to take actual conditions, there would have to be an adjustment in that maximum from ten feet down to nothing?

A. Yes, sir.

Q. Would that be an average of about five feet?

A. An average of five feet.

Q. I wish to introduce another map, which we will designate as Plaintiff's Exhibit No. 5.

Judge McMillan: Can you pull that out?

(Thereupon, said map was admitted in evidence as Plaintiff's Exhibit No. 5.)

By Mr. Baker:

Q. What is this map, Mr. Sorenson?

A. This is another 3,000 foot map of the field showing limits of the field, the wells and leases and depleted areas of the field, indicated in red. Those are areas of wells producing for a time and have now been abandoned, both on the east and on the west.

Q. And on the north and on the south, all around the field?

[fol. 77] A. All around the field. Also, the green area is the area of water encroachment. Those wells have been affected by bottom hole water.

Q. Are all of them drowned out, or are they now producing?

A. They are now producing, but at one time or another they have produced salt water.

Q. Are the Humble leases shown on that map?

A. Yes, sir, shown in yellow.

Q. What is the significance of this gray area in the southeastern part of the field?

A. There is an area where the sand isn't as porous and permeable as the other parts of the field. There is more shale in sections.

Q. What is the significance of the two lines running in a northerly and southerly direction to the middle of the field?

A. That is the easternmost limit of the bottom hole water.

Q. Which is it originally?

A. The western end, and the eastern land shows the abandonment.

Q. As of what date?

A. January 1, 1938.

Q. And the westerly one was where it was originally?

A. The original line.

Q. Mr. Sorenson, I will ask you whether or not all of these maps introduced in your opinion fairly represent actual conditions in the field that they purport, severally purport to represent?

A. Yes, sir, they do.

Q. Exhibit—I believe you said Exhibits 1, 2, 3, and 5 were prepared by the Humble Company?

[fol. 78] A. Yes, sir.

Q. By whom were they prepared, what department?

A. Geological Department.

Q. Have you familiarized yourself with the facts depicted on those maps?

A. Yes, sir, I have.

Q. Mr. Sorenson, I wish to ask you a number of questions concerning generally the reserve in the East Texas field. Have you familiarized yourself with the sand thickness in the field as a whole?

A. Yes, sir.

Q. And the sand thickness under the Humble properties?

A. Yes, sir.

Q. Have you made a comparative study of the relative sand thicknesses and quantity of sand in the field as a whole and under Humble's leases?

A. Yes, sir, I have.

Q. Has the company compiled a great volume of information on that subject?

A. Yes, sir, we have.

Q. What was the area of the field, approximately, originally?

A. 133,000 acres.

Q. According to the Railroad Commission's schedules, what now is the approximate extent of the producing area of the field?

A. 131,331 acres.

Q. About how many acres are occupied by the Humble producing properties in the field?

A. 14,656 acres.

[fol. 79] Q. Can you state what was the original sand thickness, average sand thickness for the field as a whole?

A. The original sand thickness was 37.78 feet.

Q. Do you mean the thickness of the producing section or effective——

A. Net effective sand.

Q. What do you mean by "net effective sand"?

A. The sand of average porosity within the producing section capable of holding oil, discounting the amount of shale or ash that might be in that producing section.

Q. Do you mean that is the net amount of sand that actually contained oil within it?

A. Yes, sir.

Q. Will you state whether you have determined the original average sand thickness for the Humble properties?

A. The Humble properties had an original net sand thickness of 48.29 feet.

Q. As against, I believe you said, 37.78 for the field as a whole?

A. Yes, sir.

Q. Are you talking about net effective sand thickness for the Humble properties too?

A. Yes, sir.

Q. You mean by that the amount of, net amount of sand that contains oil under the Humble properties?

A. Yes, sir.

Q. Did contain oil originally?

A. Originally.

Q. How much thicker, on an average, was the sand under [fol. 80] Humble's properties, oil sand under Humble's properties than under the field as a whole?

A. Approximately 10 feet thicker.

Q. Have you computed the number of acre-feet in the field as a whole?

A. Yes, sir, 4,961,546 feet.

Q. What does the isopach map of the Railroad Commission show in that respect?

A. That is the Railroad Commission figure.

Q. Now, in making the computation, have you or not made an adjustment to take care of the arbitrary allocation of 10 feet to the marginal or peripheral contour?

A. Yes, sir, it is deducted.

Q. What average did you give that contour?

A. Five feet.

Q. You say that after you made the adjustment, the field as a whole has 4,961,546 acre-feet of sand?

A. Yes, sir.

Q. Have you made a calculation——

Mr. Moody: Is that net or saturated sand?

By Mr. Baker:

Q. Do you mean by that that is net?

A. Net sand originally.

Q. Do you mean to say that was originally saturated with oil?

A. Yes, sir.

Q. Have you made a calculation to determine the original number of acre-feet of net oil sand under the Humble's properties according to the Commission's isopach map?

A. Yes, sir, we had 707,770 acre-feet of sand.

Q. Was that saturated sand?

A. Yes, sir.

[fol. 81] Q. Do you mean to say that all of that sand had oil in it?

A. That is true.

Q. Did you consider it from the same standpoint that you use in considering the amount of acre-feet of sand under the leases—in the field as a whole?

A. That is true.

Q. What percentage, according to those figures, of the acre-feet of sand in the field as a whole, did the Humble have?

A. 14.27 per cent.

Q. Which would be from the Railroad Commission's map?

A. From the Railroad Commission's map.

Q. After making the adjustment you spoke of a moment ago?

A. Yes, sir.

Q. If the—have you checked these data against the Humble Company's figures also?

A. Yes, sir, since the Commission put out a sand thickness map, we have made that computation.

Q. Do or not the Humble figures check substantially with the Commission's figures?

A. Yes, sir, they do.

Q. Does—do the Humble figures indicate that the Humble's properties have at least 14.3 per cent of the net effective oil sand in the field?

A. That is what our figures showed, 14.3.

Q. They substantially correspond with the Commission's figures?

A. Yes, sir, they do.

Q. How many wells, producing wells are in the field at this time, according to your information?

A. 25,970 wells, as of February 1.

[fol. 82] Q. Of this year?

A. Yes, sir.

Q. How many producing wells were there under the Humble's leases—on the Humble's leases in the field?

A. 2,547.

Q. I wish to ask you, Mr. Sorenson, whether or not you feel that the amount of effective oil sand in an oil field can be accurately determined?

A. Yes, sir, it can be determined to an accurate degree.

Q. What do you mean by an accurate degree?

A. Within less than 10 per cent.

Q. Within 10—a maximum of 10 per cent possible error, would you say?

A. Yes, sir.

Q. Will you describe for the Court the method usually employed in estimating the sand section and the net effective oil sand in the section?

A. Yes, sir. To determine the section, by the use of core records and cores and cuttings, or electrical logs, you can determine the thickness of the sand from the top to the bottom of the sand, either to the water or to the base of the sand itself.

Q. That will give you the total sand section, will it?

A. That will give you the total section that contains oil, shale, or something else.

Q. How do you determine the net effective oil sand?

A. By subtracting the impermeable materials leaves the net effective sand.

Q. Can you with that data that you have mentioned in the [fol. 83] East Texas field or not within reasonable accuracy determine the amount of shale and impervious material in those sand sections?

A. Yes, sir, on the wells drilled. We have that information.

Q. Can you correlate that information between the various wells with reasonable certainty?

A. Yes, sir.

Q. Is that method you mentioned just your method, or is it generally employed by geologists and engineers in determining effective oil sand?

A. That is the general method.

Q. Is that relied upon by geologists and petroleum engineers?

A. Yes, sir, it is.

Q. Do you mean to say that that is the only feasible method that you know of, or not?

A. It is the only feasible method that I know of.

Q. How do you determine the amount of oil in your effective oil sand?

A. You reduce the effective sand to barrels, or a porous space. Then, subtract the amount occupied in the porous space by connate water. Then, by a study of oil itself, you will know how much gas is in solution, and how much space a barrel will occupy in the reservoir, compared to that same amount of oil at the surface.

Q. In making your estimates, do you usually consider the barrels at the surface, the barrels of oil at the surface in estimating quantities in the reservoir?

A. Yes, sir.

[fol. 84] Q. How can you determine the amount of porous space that is available for holding oil and water?

A. By examination of cores, laboratory analyses of cores.

Q. Is that an accepted and generally used method?

A. Yes, sir.

Q. Is it used generally by geologists and engineers?

A. Yes, sir, it is.

Q. You stated a while ago, I believe, that Humble had, according to the Railroad Commission's isopach, 14.27 per cent, originally had 14.27 per cent of the acre-feet of sand in the field?

A. Yes, sir.

Q. Is that correct? Now, have you made any further calculations to determine the Humble Company's present percentage of acre-feet of sand in the field?

A. Yes, sir.

Q. What do your calculations show—how do you—I will ask you this. Up to what date are those calculations brought?

A. Brought up to the first of February, 1940.

Q. What do your calculations now show that the Humble's percentage of that net effective oil sand in the field is?

A. It still remains approximately 14.3 per cent.

Q. Approximately. Is it at least that much?

A. At least that.

Q. Now, would Humble's percentage of the recoverable oil change, whatever recovery figure you use?

A. No, sir, the percentage would not change. The reserve would, but the basis stays. So long as our reserve remains a constant figure, our percentage would be the same.

[fol. 85] Q. Can you take the acre-feet and net effective sand and calculate the total amount of oil in the sand per acre-foot?

A. Yes, sir.

Q. Can you calculate the total amount of recoverable oil under given conditions?

A. Under given conditions you could.

Q. You think that that could be done with reasonable accuracy?

A. Yes, sir, I think it can be done.

Q. Can that be done in the field as a whole?

A. Yes, sir, for the field as a whole.

Q. Can it be done under the Humble's leases?

A. Yes, sir.

Q. Have you made calculations to determine the Humble's percentage of recoverable oil in the field?

A. Yes, sir.

Q. What do you estimate that to be?

A. 14.3 per cent.

Q. You mean in place?

A. In place.

Q. In the reservoir?

A. That is true.

Mr. Hart: At this time?

Mr. Baker: Is that originally?

A. That is originally, and now, too.

Q. The company's percentage has remained practically the same?

A. Yes, sir.

Q. Suppose that you use a recovery factor of just, say, a [fol. 86] thousand barrels per acre-foot. What would Humble's percentage of the recoverable reserve be?

A. It would be 14.3 per cent.

Q. Suppose you would use a recovery figure of 900 barrels per acre-foot. Would it be the same?

A. Yes, sir.

Q. Or 1100 barrels, or any other figure?

A. That is true.

Q. Will you state the density to which the Humble Company has drilled its properties in the East Texas field?

A. We drilled to a density of one well to each 5.8 acres.

Q. How densely has the field on the average—the field as a whole on the average been drilled?

A. 5.17 acres.

Q. Considering those properties other than the properties of the plaintiff, to what density have they been drilled?

A. To a density of slightly more than one well to 5 acres.

Q. Is that more dense than the Humble's properties are drilled?

A. Yes, sir.

Q. I believe that is all for the present, Your Honor.

Judge Sibley: Does any oil come into this field as a whole?

A. No, sir, the limits of the field have been marked.

Judge Sibley: There is no oil flowing in from other places?

A. No, the oil in the field is trapped, and there is no more oil coming in.

Judge Sibley: It is the salt water that is coming in?

[fol. 87] A. The salt water is coming in and holding the oil against the roof of the reservoir.

Judge Sibley: Your reserve remains constant because of the favorable location of your leases?

A. Because our leases are so wide-spread throughout the field.

Judge Sibley: Somebody is losing the oil that is taken out. I suppose the marginal reserves are being depleted?

A. To the west depletion takes place, but not to the east. To the west it seems the oil is depleting the oil sand as it is being withdrawn.

Judge Sibley: We will take a recess until 2:00 o'clock.

(Thereupon, at 12) o'clock M. Tuesday, February 13, 1940, a recess was taken until 2:00 P. M. of the same day.)

[fol. 88] Afternoon Session. 2:00 o'clock

Judge Sibley: Is the witness on the stand, gentlemen?
Mr. Baker: He is here, Your Honor.
Judge McMillan: What are your initials, Mr. Sorenson?
The Witness: I. L.
Judge Sibley: Any further questions of this witness?
Mr. Baker: Yes, sir, I want to ask a few more, if Your Honor please, but at this time I would like to introduce as Humble's Exhibit No. 6 some cross sections of the East Texas Field.

I. L. Sorenson, a witness for plaintiff, resumed the witness stand and testified as follows:

Direct examination continued.

Questions by Mr. Baker:

Q. Mr. Sorenson, would you mind stepping over here, please?

Mr. Hart: If the Court please, I would like to have some evidence as to who prepared them and so on before we know whether we want to make any objection to them.
Judge Sibley: Yes, sir.

Q. Mr. Sorenson, are you familiar with these charts that I have in my hand?
A. Yes, sir.
Q. What have you had to do with them?
[fol. 89] A. They were prepared in the Geological Department, and I have examined them and checked the sections,—all of the sections.
Q. Have you checked the data from which they were compiled?
A. Yes, sir, the data from which they were compiled and their geological location in the field.
Q. Have you checked against the well records from which the compilation was made?
A. Yes, sir.
Q. Do you think that this is a fair representation of what it purports to represent?
A. I do.

Mr. Hart: May I ask a question or two, please?
Judge Sibley: Yes, sir.

Examination by Mr. Hart:

Q. Mr. Sorenson, do you have access to the information on which these charts are based?
A. Yes, sir.
Q. That is available here, in case we want to cross examine you about them? They are available and you can testify about them?
A. The logs are not here but we could get them; they are available.
Q. Well, they will be made available in case we wish to cross examine you about these cross sections?
A. Well, I don't know whether we have them here in Austin, but we can get them up here in very short order if you will specify which ones you want.
Q. Well, I don't know which logs they are based on, but I would like to have them in case we desire to cross examine [fol. 90] you on them. And I want to ask you is it your statement that these are correct interpretations of the basic facts from which these cross sections are made?
A. Yes, sir, I think it is a fair representation.
Q. All right, sir, and you are prepared to defend the charts yourself and not somebody else?
A. Yes, sir, I am prepared.

Mr. Hart: All right, no objection.
Mr. Baker: If the Court please, I would like to say that we did not bring the logs because I was talking over the telephone, I think it was on Saturday, with Mr. Hart and he told me——
Judge Sibley: Well, you can introduce them and counsel says if he can get the logs—he will know what he wants I suppose and will give you a fair opportunity to bring what he wants, if he wants anything.
Mr. Baker: Well, I didn't bring anything because I thought Mr. Hart said it would not be necessary.
Mr. Hart: If the Court please, I think Mr. Baker misunderstood me. I said that in general I would not require an expert witness to first introduce the basic information before giving his opinion on it, but we might want to have available that information if we want to cross examine him on it.

Mr. Baker: Well, I certainly misunderstood you.

Judge Sibley: All right, you may examine him on the charts.

Q. Mr. Sorenson, will you explain that first chart in the Humble's Exhibit No. 6?

[fol. 91] A. That is a north-south cross section of the East Texas Field through the Fairway. The wells are——

Q. Just a moment please. Where is that indicated on this?

A. In the center of the field starting at this point (indicating) from the northernmost well extending through the field to the southern extremity of the field.

Q. Will you explain that to the Court please?

A. These facts are based on electric logs from the top of the sand to the base of the sand, or as far as the wells penetrated the sand. The darker colored area represents the sand. The 3320 foot below sea level plain is marked by this dotted line, and the lenses of shale are represented by the blank white area in the sand section.

Q. Will you show the next one please? Let me ask you this question about that first chart,—what does that indicate as to the permeability and the continuous nature of the body of sand in that cross section?

A. It shows that the section is very uniform from one end of the field to the other end, and is a permeable porous sand.

Q. Now, the second chart, where was that taken from?

A. Section AA is across the northern portion of the field, in what is known as the Longview District.

Q. Explain this——

A. On that map it is indicated as section AA (Indicating on other map).

Q. Will you explain this cross section, please?

A. It also shows the sand in that area of the field in an east-west direction, or west-east, I will say, and shows also the original water level and the present water level; also the shales in the sands.

[fol. 92] Q. What is it that shows the present water level?

A. This area that is above 3320 and not darkened; it is those reentrants in the electric logs where the resistivity decreased.

Q. Well, what does that plat indicate with respect to the continuous nature of the sand body?

A. It shows that it is a very continuous sand.

Q. You mean that there are very few shale breaks there?

A. That is indicated, yes, sir.

Q. Let's have the third one, please. Now, where is that one, the third one taken from?

A. This is section BB across the northern part of the field, from Gladewater eastward.

Q. Explain that cross section, please.

A. This one also shows the sand and the water level and the shale that is encountered in these wells.

Q. By the way, how can you tell that the shale is in any particular area or that oil is in any particular area or that water is in any particular area from reading your electric logs?

A. By the section through the sand showing the resistivity of the sand that is in that sand. The resistance of the oil sand is very great and the salt water sands are very conductive to electric current.

Q. Well, what does that show with reference to the continuity of your sand body?

A. It shows the sand body as being continuous from the westernmost part of the field to the east.

Q. Now, let's see the fourth one, please.

[fol. 93] A. Section CC is an east-west section across the field, in the vicinity of Kilgore.

Q. That is about the middle of the field?

A. That is about the middle of the field north and south. It also shows a continuity of the sands, the water level, and the shale, and the materials in the sands.

Q. Let's see the next exhibit.

A. Section DD is an east-west section in the vicinity of Overton on the west, to Pitner Junction to the east of the field.

Q. Is that the south middle section of the field, say?

A. Yes, sir.

Q. Please explain that.

A. It also shows the continuity of the sands and the location of the water level and the shale breaks in the sand body.

Q. What do you mean by shale breaks?

A. There are some impervious shales within the sand body above the water.

Q. Now, in some cases you draw those to indicate—I mean you have indicated there continuous shale bodies. How do you arrive at the fact that those are continuous?

A. If there is a co-relation between wells—if those shales appear in the same position in two nearby wells you can figure that they are continuous between the two wells.

Q. It is a matter of co-relation, is it, between wells?

A. Yes, sir.

Q. Well, let's see the next one, please.

A. Section EE is drawn from the south part of the field east-west below the townsite of Old London.

[fol. 94] Q. Explain that cross section to the Court.

A. It also shows the continuity of the sands, the level of the water and the shales in the sand body.

Q. All right. Let's see the next exhibit please.

A. Section FF is an east-west section, just south of the last one shows.

Q. What does that show?

A. It also shows the water level, the continuity of the sands and the positions of the shales.

Q. All right, let's see the next one, please.

A. Section GG is in the southernmost part of the field, below the Joinerville area.

Q. What does it show?

A. It also shows the water level, the top of the sand, and the continuity of the sand.

Q. Well, does each of those cross sections show the wells from which the electric logs were taken?

A. Yes, sir.

Q. You might explain what an electric log is. What do you mean by that?

A. It is the resistivity record of the formation in the bottom of the hole which you are trying to measure.

Q. How do you get that record?

A. By running the logging devices that are operated by various commercial agencies that sell that service.

Q. Is that what is sometimes called a Schlumberger gauge log?

A. Yes, sir, Schlumberger was the original electric logging device.

Q. Now, what would you say that this indicates with reference to the continuity of the sands in the East Texas Field?

[fol. 95] A. It shows that the sands are very continuous and regular throughout the field.

Q. Would it indicate that there is intercommunication between all parts of the field or not?

A. It indicates intercommunication, yes, sir.

Q. Are there portions of the field where the permeability of the sands is greater than in other portions?

A. Yes, sir, in the edges of the field, there is some difference.

Q. What edge?

A. The east edge particularly, has the impermeable zones.

Q. Well, is there any particular area in the field where you may say the permeability is less than in the rest of the field, generally?

A. Well, in the southernmost part of the field, that darkened area, is on the salt water, and there is an area of tight sands and considerable shale.

Q. Generally speaking, are the sands in the East Texas Field—do they have high porosity, Mr. Sorenson?

A. High porosity, and high permeability, yes, sir.

Q. What do you mean by permeability?

A. The ability of the passage of fluid through the sand.

Q. And what character of sand is it that gives it permeability?

A. Porosity is the factor of the permeability, and the permeability is the ability of that sand to give up the fluid within it or the passage of the fluid through that sand.

Q. Will you explain, please, to the Court, just what happens in that reservoir as these wells are produced. Could you draw a picture of just what takes place, what is the behavior of the reservoir?

[fol. 96] A. Well, if the oil is removed, there is an advancement of the water laterally and vertically against the remaining oil, pushing the oil forward up the structure and into the well bore, and as it is produced, this water advances and maintains the pressure against the oil.

Q. Where is the water?

A. It is in the western portion of the field, and covering about half of the field, advancing as a wedge against the water zone.

Q. Well, is it underneath the oil and pushing the oil upward and eastward, you say?

A. Yes, sir.

Q. Do you consider that the water drive is an important factor in the operation of the field?

A. Yes, sir, it is the source of your energy.

Q. Is it or not important that the top allowable be maintained that will permit the proper utilization of the reservoir energy?

A. That is true.

Q. Mr. Sorenson, have you considered the varying densities to which wells are drilled in that field?

A. Yes, sir.

Q. Have you some figures that you could give to show the varying densities in the field?

A. Yes, sir.

Q. Will you give us those figures, please?

A. Yes, sir, they are the densities of less than—of a well to less than a half acre. There are 109 acres with 360 wells. The acres per well would be .1 and .4 per well or an average [fol. 97] of .3 of an acre per well. On 374 acres, 523 wells were drilled with a density of a well to each .5 to .99 of an acre, or an average of .71 of an acre per well. On 2013 acres 1336 wells were drilled with a density of one acre to one and .9 acres per well, or an average of 1½ acres per well. On 5637 acres 2237 wells were drilled, with a density of one well to each two to 2.9 acres or an average of 2½ acres per well; on 3,160 acres 7,331 wells were drilled to a density of three acres to 4.9 acres per well, or an average of 4.1 acres per well. On 57,448 acres 9,849 wells were drilled with a density of a well to 95 acres to 6.9 acres, or an average of 5.85 acres per well. On 37,159 acres 4,128 wells were drilled to a density of above 7 acres per well, or an average of 9 acres per well.

Mr. Baker: We would like to offer that tabulation, as a matter of convenience.

(Thereupon the tabulation above referred to was marked as Humble Exhibit No. 7.)

Mr. Baker: I believe that is all.

Mr. Fischer: I would like to ask this witness one or two question-, if Your Honor please.

Judge Sibley: You may proceed.

Cross-examination.

Questions by Mr. Fischer:

Q. Mr. Sorenson, now you figure out that the Humble owns this 14.3 per cent of the oil in the reservoir from this map you have got on the wall over here, is that right?

A. Yes, sir.

Q. Yes, sir. Now, you made the map by taking logs at [fol. 98] various wells in the East Texas Field—is that correct?

A. Yes, sir.

Q. How many wells did you take logs of?

A. Well, all the wells are spotted on the map; there are over twenty-five thousand we have examined to get the logs of them. We examined cores on hundreds and checked logs on over a thousand.

Q. Well, as I read your map—I am not very good at reading maps, but as I read it there, you have certain control points, don't you—drilled wells?

A. That is on the work sheets; that isn't placed on the map.

Q. Uh huh. And anyway, you didn't take a Schlumberger of every well in the field?

A. No, sir, it has not been run on every well.

Q. No, sir. You didn't take a log of every well in the field, did you?

A. No, sir, we have the sand top of every well in the field.

Q. Yes; the fact of the matter is, now, isn't it, that in making up this map you took a picture or a log of a well here and then you would go over two miles and took the other one, and then you would average what you thought was the sand structure between those two wells?

A. We didn't go that far. We have representative wells covering the field.

Q. Yes, sir. Well, now, then, you said, as I understood you this morning, that there would be ten per cent error in your calculations, wouldn't there?

A. There is a possibility of that much.

Q. Yes.

[fol. 99] A. But that is the limit; we feel we are within that degree of accuracy.

Q. Well, is that ten per cent error in the well that you were looking at?

A. No, in the total estimation of the field.

Q. You mean you can estimate what is between two wells that are two miles apart, within a degree of accuracy of ten per cent, is that right?

A. I told you they were closer together than two miles.

Q. Yes, sir. Well, how close were they?

A. The density of the field is one well to 5.17 acres, and we spotted all the wells in the field.

Q. I don't care about your spotting them. I am talking about how often did you run this Schlumberger of your own down and get a picture of the sand formation and the porosity of the sand there as to make up your map so you can tell that you own 14 per cent in all that field. That is what I am asking. How many wells did you have a picture of?

A. I can't give you the total now; we have many hundreds.

Q. Didn't you testify before the Commission it was around two hundred?

A. No, sir, I didn't testify that.

Q. Well, maybe it was Doctor Moore that did that. You don't know the exact number?

A. No, I don't.

Q. You know the London area, don't you, the Old London?

A. Yes, sir, I know where it is.

Q. You know where my little lease is out there—my little well?

A. Yes, sir.

[fol. 100] Q. What is the sand thickness there—the saturated sand thickness as shown by your map here?

A. Do you want me to check it out?

Q. No, I asked you to look at it before you took the stand.

A. I looked at it but I can't say that I found your well. If you will point it out I will read the map for you.

Q. Well, if you can tell, I wish you would do so. It is in the sand section. Do you know how much the sand thickness is there?

A. If I spotted your well correctly, the Railroad Commission map shows you have 70 feet beneath it.

Judge Sibley: How much?

The Witness: 70 feet.

Q. Yes, sir, I think that is right. All right. Now, these wells have never been produced so as to permit any waste, have they?

A. I don't know; I don't know how long they have been producing.

Q. Well, do you know what the Commission's potential figure on them is? They say the—the Commission says that for my well it is on an average of 800 to 850 barrels

per hour; that is 19,000 barrels, and I am producing now 17 days a month. That wouldn't be any waste, would it?

A. No, sir, not on that tract.

Q. Even if I produced at 30 days a month at 20 barrels, there wouldn't be any waste?

A. No, I don't believe there would be any waste in that area at that rate for your tract.

Q. Do you think if I produced maybe 50 barrels a day there would be any waste there out of 20,000 barrels?

A. No, as long as you maintained a reasonable top allowance.

[fol. 101] Q. Yes, sir. All right. Now, where my lease is situated there, it is in the middle of the field, isn't that what you call the Fairway?

A. Yes, sir.

Q. Where the structure is high, is that right?

A. Yes, sir, it is very well located on the structure.

Q. Yes, sir. Now, you testified before the Commission here, a little while ago, didn't you?

A. Yes, sir.

Q. And Doctor Moore, he testified—that is another geologist with the Humble?

A. Yes, sir, an engineer for the Humble.

Q. Yes, sir, as I understood you at that time you said that I had the same amount of oil to date under my lease as I had when I started, is that correct?

A. Yes, sir, that is true.

Q. That is right. And that comes about by being situated where I am on the structure, that every time I take out a barrel of oil the water pressure on the west puts another one in?

A. Yes, sir, that is through your peculiar position on the structure.

Q. Yes, sir. That is a fact, isn't it?

A. Yes, sir.

Q. All right. Now, did the Humble Company have any leases situated like mine on the structure?

A. Yes, sir, we have leases all over the field.

Q. Well, you have got some you say situated in the middle of the field where the water puts in a barrel every time you take one out?

A. Yes, sir, we have.

[fol. 102] Q. How many acres have you got of that kind in your leases?

A. Our acreage east of the water line?

Q. Yes, sir.

A. 6921 acres.

Q. Yes, sir. Now, on that 6921 acres has that land got the same amount of oil in place as it had originally when you started taking oil out?

A. Essentially so, yes, sir.

Q. Well, essentially? You mean the same, don't you?

A. Well, there is a little difference in the expansion.

Q. Well, approximately the same.

A. Yes, sir, approximately the same.

Q. Well, every time you took a barrel of oil out, the Lord shoved in another one from the west, isn't that right?

A. That is true.

Q. All right. Do you know how many you have already taken out?

A. No, sir, I don't have that figure.

Q. Well, do you know approximately how many you have already taken out?

A. Approximately 53 million barrels.

Q. You have taken approximately 53 million barrels out?

A. Yes, sir.

Q. And you have still got what you had to start with?

A. Yes, sir.

Q. Yes, sir. All right, thank you.

Mr. Fischer: That is all I care to ask the witness, Your Honors.

Judge Sibley: Governor Moody, do you wish to ask this witness anything?

[fol. 103] Examination by Mr. Moody:

Q. Mr. Sorenson, are you acquainted with the locations on the—in the field of the Rowan-Nichols-Todd A lease?

A. No, I know it is in the Castleberry Survey. It is in the southern section of the field. I could find it for you.

Q. Are you acquainted with the sand thickness in that part of the field?

A. From our maps I could tell you.

Q. You couldn't tell without going over there and looking at the maps?

A. No, sir.

Q. All right. There is one other matter I would like to ask you about. You have spoken about bodies in the struc-

ture. Could you describe that field or a cross section of it as being somewhat like a triangle with the top side of the sand as the long side of the triangle, and where the water is one of the short sides, and then I believe it is the Georgetown Lime the other side of it. Does that describe it or not?

A. Yes, sir; that is, the long side would be the roof of the structure.

Q. The long side would be the roof of the structure; and the water is about halfway across on one of the sides?

A. Yes, sir.

Q. The one that you say lies flat, that water is moving and pushing the oil up that structure, is it not?

A. That is true.

Mr. Moody: That is all.

Judge Sibley: Mr. Hart, you may cross examine.

[fol. 104] Cross-examination.

Questions by Mr. Hart:

Q. Mr. Sorenson, if you don't mind, I believe I would like for you to get those Schlumberger logs that you used in making these cross sections. You say they are available. I would like to have them here so we may look at them in order to examine you about these cross sections.

A. Yes, sir, I will get them.

Q. All right. Now, Mr. Sorenson, you introduced in evidence here a tabulation showing the drilling density in the field by certain classifications. Now, you have that sheet available there that you used?

A. It was introduced in evidence. (Witness refers to sheet.)

Q. All right, sir. What is that exhibit number, so we can refer to it by the record?

The Reporter: That exhibit has been marked as Humble's Exhibit No. 7.

Q. Now, on that tabulation you have five classifications of wells before you get to a density of one well to five acres, don't you?

A. Yes, sir.

Q. All right, sir. Now, there is only a very small percentage of the wells in the field within that very densely

drilled classification, or in those two very densely drilled classifications, isn't that true?

A. Do you mean below .7 of an acre per well?

Q. Yes, sir.

A. Yes, sir, there are 883 wells in that classification.

Q. All right, sir. Well, now, how many wells are there [fol. 105] that are drilled to a greater density than one well to five acres. Can you total up this number of wells in this first five classifications you have got there; or maybe it would be easier to take this total of wells in the lease to classifications and then subtract them from the total number of wells.

A. There are 13,977 wells in the less densely drilled divisions.

Q. All right. There are 13,977 wells in the less densely drilled classifications—that is, on tracts having density of one well to five acres or less densely drilled than that, up to one well to nine acres?

A. That is correct.

Q. All right. Now, there are how many wells drilled on the more densely drilled tracts?

A. 11,787.

Q. All right, sir. Then, whereas, there are 13,977 wells on the less densely drilled tracts, beginning with five acres and going to one well to nine acres, there are only 11,787 on the tracts which are drilled more densely than that, isn't that correct?

A. Yes, sir.

Q. I believe you testified that the Humble density on the average is one well to about 5.8 acres, is that correct?

A. Yes, sir.

Q. What percentage of the wells that the Humble has drilled have been drilled as exceptions to Rule 37?

A. I don't know offhand.

Q. Well, there are very few of them that haven't been drilled as exceptions to Rule 37, haven't they?

A. I can give you the exact figure, but I don't have it [fol. 106] with me. I would rather get the exact figure for you.

Q. Well, can you give me an idea of what that percentage would be at this time?

A. Well, I would rather not because I would rather get the total number.

Q. Can you give me an approximate estimate of it at this time?

A. I would rather not do that. I can get you the exact figure.

Q. Well, will you get me the exact figure?

A. Yes, sir, I will be glad to.

Q. And let me have it?

A. Yes, sir.

Q. All right, sir. Now, Mr. Sorenson, I believe you testified that your estimate of the original acreage in the field was 133,000 acres, is that correct?

A. Yes, sir.

Q. I believe you testified that the Railroad Commission's estimate of the present number of acres in the field is 131,331?

A. No, that was the original too.

Q. That was the original?

A. Yes, sir.

Q. I see. Your idea is that it was somewhat larger than that, is that correct?

A. That was our figure, yes, sir.

Q. All right, sir. Now, do you have an estimate of the number of productive acres in the field at this time, according to your estimate?

A. We have compiled a new map as of June 1st, 1939.

Q. All right; is that the latest map you have on that?

A. Yes, sir.

[fol. 107] Q. All right. Now, what is your estimate then of the number of productive acres in the field at that time?

A. I don't know whether I have that figure or not. I have the present estimated extent of the field from the Commission map, of 131,331; that is from the present Railroad Commission map.

Q. Yes, sir. But I understood you to say that that was the estimate that the Commission gave of the original extent of the field according to their map, is that correct?

A. Well, it is present. If I said the other, I was confused.

Q. That is the present extent?

A. That is the present extent, yes, sir.

Q. All right. Now, is your estimate of the present acreage—of productive acreage in the field the same as the Railroad Commission's or is it different?

A. It is substantially the same, yes, sir.

Q. It is substantially the same as that. All right, sir. Now, how many productive acres in the field did the Humble Oil and Refining Company have originally?

A. I have it based on the present Railroad Commission map, that figure. I do not have the older figure.

Q. Well, what do you have—do you have the present number of productive acres in the Humble leases or the original number of productive acres?

A. I have the present, taken from the Railroad Commission map.

Q. Well, do you agree that the Railroad Commission map is substantially correct in that respect?

A. Yes, sir, it checks our map.

Q. Well, what is your figure on the present number of [fol. 108] productive acres that the Humble has in the field?

A. The present acreage is 14,656 acres.

Q. Is that the same number of productive acres which the Humble originally had in the field?

A. It would probably be a little greater than the original but——

Q. Well, how much greater would it be?

A. I don't have that figure with me.

Q. Well, who does have it, if anybody?

A. We perhaps have it in our files.

Q. Well, do you think you could get that for me?

A. Yes, sir. Let me make a list of these things you are asking for. There are so many of them, I might forget.

Q. Mr. Sorenson, let me ask you how you could calculate the number of original acre-feet in the Humble leases without knowing how many productive acres there were originally in the Humble leases?

A. Well, we are dealing with two or three different maps.

Q. And haven't you got here an estimate of your number of acre-feet originally in the Humble leases of 707,780 acre-feet?

Judge Sibley: Isn't there a question of what they bought and what they abandoned? He may know what they have abandoned or bought new.

Mr. Hart: If the Court please, I understood there has been testimony about the number of original acre-feet and the present number of acre-feet.

Judge Sibley: The field has stayed the same, regardless of private ownership. My thought is the Humble may have [fol. 109] bought more acres and may have abandoned some.

Mr. Hart: Yes, sir, excuse me. I may have misunderstood.

Q. I mean, Mr. Sorenson, regardless of the number of acres originally in the leases now owned by the Humble, the number of productive acres in those leases, whether the Humble has owned them throughout the life or not.

A. All right; if I understand your question correctly, you want to know how many acres we originally had in the field.

Q. How many productive acres you originally had—there were originally in the Humble leases in the field—that is, taking the same leases that you own now, how many productive acres were there originally in those leases?

A. Well, we would go back to the Railroad Commission map and we have been using it, and from the Railroad Commission map our original productive acres is still—was 14,656, and that is what the Commission map shows today.

Q. All right, sir. Then the Humble today has the same number of productive acres in its leases as there were originally when the field was open, is that correct?

A. Yes, sir, based on the Commission map, that is what we have.

Q. All right, sir. Then, there has not been any part of the Humble leases abandoned; you still have the same number of productive acres as there were originally in the Humble leases?

A. Substantially so, yes, sir.

Q. Substantially the same; all right, sir. Now, was your estimate of the number of acre-feet of productive oil sand in the Humble leases originally 707,780; Is that the figure which you gave?

[fol. 110] A. That is the figure I gave, based upon the Commission's original map.

Q. And you accept that figure as being substantially correct, do you not?

A. Yes, sir.

Q. Now, what was the original number of acre-feet net effective sand in the field as a whole?

A. The field as a whole had 4,961,446.

Q. 446?
A. Yes, sir—no, 546.
Q. 546?
A. Yes, sir.
Q. Now, would you give the number of acre-feet of net effective sand in the field today?
A. No, sir, I don't have that.
Q. Well, have you made that calculation?
A. Yes, sir, it is calculated in our last map.
Q. What is that figure? Can you get that figure for me?
A. I don't have it with me. It is the figure of June 1st.
Q. Can't you give me about how much it is?
A. No, sir, I wouldn't want to guess at it.
Q. Well, is it 1,000,000; 2,000,000, or what?
A. I would prefer to wait and get the exact figure.
Q. Now, Mr. Sorenson, to figure out the exact acre-feet of sand the Humble now has you would have to know how many acre-feet of sand were in the whole field, wouldn't you?
A. Yes, sir.
Q. Still you can't give me an approximate idea even of the number of acre feet of sand in the field today?
A. I would be glad to get you the figures. I don't have [fol. 111] them with me.
Q. You can give me an approximate idea, whether it is still about 3,000,000 or 4,000,000 or whether the field has been depleted any, and if so, how much?
A. I can guess at it, but I prefer not to do that. We can get our present records and bring them to you and you will have our present idea.
Q. Mr. Sorenson, there is no way in the world of figuring out the percentage that the Humble has of the present per acre feet there is in the whole field, is there?
A. Our percentage is the same because of the widespread distribution of our leases.
Q. You mean regardless of the number of acre-feet in the field today the Humble would still have a percentage of 14.3 per cent?
A. That is the way it works out at this time.
Q. Acre-feet of sand. I am not talking about recoverable oil. I am talking about acre-feet of sand.
A. Acre-feet of sand, that is true. The advancement of the water has been over the western half of the field, and our leases are distributed all over the field, so the percentage will remain the same.

Judge Sibley: You lost as much in proportion as the field as a whole had, is that what you mean?

A. Yes, sir.

Q. Now, Mr. Sorenson, is that your only basis of saying now that the Humble has today 14.3 per cent of the acre-feet of sand remaining in the field at this time?

A. That is based on our record of the field. I will find it for you. I don't have it with me on the sand, but we have [fol. 112] made the obligation. We can furnish our present records.

Q. In order to figure out what your percentage of the present acre-feet of sand is you had to have a figure for the acre-feet in the field and you had to have a figure for the acre-feet of sand in the Humble leases, didn't you, and divide one into the other to get the percentage?

A. Yes, sir.

Q. You don't have the figure for the whole field today?

A. No, sir, I don't have it with me today.

Q. Will you get it?

A. Yes, sir.

Q. Do you have the acre-feet of sand in the Humble leases today?

A. No, I told you I don't have them with me.

Q. You don't have that either?

A. I have the percentage. If I may make a list of what you want I will get that.

Q. You said it was a certain percentage. I want to know how you arrived at it. Can you give me an approximate idea of the number of acre-feet of sand that the Humble has at this time?

Judge Sibley: We will rule out approximations. If he wants to be exact I think he has a right to be.

Mr. Hart: All right.

Q. Mr. Sorenson, could you tell me this: Has there been any depletion in the Humble leases up to this time? That is, are the same number of acre-feet of sand in the Humble leases today as there were originally in the field?

A. No, sir, there has been depletion on the Humble leases.

Q. Have there been any abandonments in any of the Humble leases?

[fol. 113] A. Yes, sir, we have abandoned leases.

Q. How many wells has the Humble abandoned?

A. One in the past month, but over the life of the field I can't give you the exact number.

Q. About how many have you abandoned, do you know?

A. I will get you the exact figure. I don't have that with me.

Q. Well, you show on this map here certain depleted areas on the west side of the field and on the east side of the field. I am speaking now of Complainant's Exhibit No. 5. Does the Humble have any leases in those depleted areas you show on that?

A. Yes, sir.

Q. Where do you have leases in the depleted area?

A. Do you wish me to point it out?

Q. Yes, sir, please.

A. North of the river in the Longview district we have lost wells on the Schultz and Castleberry leases. We lost wells on the Robertson tract in the Henderson district. We have lost wells at Marr.

Q. Those wells you have just spoken of shown on Complainant's Exhibit 5 are located on the east side of the field, are they not?

A. Yes, sir.

Q. What was the cause of the abandonment of those wells on the east side of the field by the Humble Oil & Refining Company?

A. They reached the end of their productive life.

Q. Why did they reach the end of their productive life? What physical factors caused that to come about?

A. Not enough bottom hole pressure to make productive wells.

[fol. 114] Q. Not enough bottom hole pressure. In other words, the pressure was not transmitted over to the east side of the field in those sections where you abandoned the wells, is that correct?

A. In those areas, yes, sir.

Q. What, in your opinion, Mr. Sorenson, prevented the transmission of the pressure across the field to those east side wells that the Humble has abandoned?

A. Very thin sands and considerable amounts of shale in them.

Q. Isn't it true, Mr. Sorenson, that in those areas where the wells have been abandoned the sand is of very low per-

meability, comparatively, and that is one reason the pressure is not kept up?

A. Yes, sir. It is the extreme margin of the field.

Q. Now, have you lost leases over here on the west side?

A. We have lost wells. We have lost no leases.

Q. You have lost wells. That is, you have abandoned wells?

A. That is true.

Q. Now, would you point out where the Humble has abandoned wells on the west side of the field?

A. We have abandoned a well in the Gladewater area, on the Johnson lease, and we abandoned a well in the Overton area, on the Joiner lease. Now, there are other abandonments, but I don't recall them.

Q. Now, as to these leases on the west side of the field, what physical factor caused the wells' abandonment there?

A. They were drowned out by water.

Q. Do you know how much oil they were producing per day when those wells were abandoned?

A. They produced oil up to the point where they pro-
[fol. 115] duced nothing more than water, they exhausted the oil.

Q. They weren't producing any oil at all when you abandoned them, is that correct?

A. Practically so.

Q. Well, about how many barrels per day were they producing?

A. They reached the point where they were not commercial wells.

Q. Well, how many barrels per day were they producing, Mr. Sorenson?

A. Very few barrels of oil and a great amount of water.

Q. How many do you mean by a very few barrels of oil?

A. Two or three barrels of oil. I can get you the complete production records of those wells.

Q. Well, if you can give me the exact figures; but your estimate is now they were producing two or three barrels per day when they were abandoned, is that correct?

A. Yes, sir, and a hundred or so barrels of water.

Q. Now, look here at the Rowan & Nichols Todd A lease in the William H. Castleberry survey. Can you locate that here?

Mr. Moody: Mark that in red. Is that all right?
Mr. Baker: All right.

Q. Mr. Sorenson, according to your map here, is that Rowan & Nichols Todd A lease east or west of the point of water encroachment up to the present time?

A. Barely east of it, a very short distance east of the eastern-most water, according to our map.

Q. About how far is it?

A. About 1,500 feet, according to this map.

Q. Then, according to your testimony that you have given already, the Rowan & Nichols Todd A lease is in that class of leases which have today substantially the same amount of oil under them as they had originally, is that correct?

[fol. 116] A. Yes, sir.

Q. Mr. Sorenson, are those wells that the Humble has abandoned, did they plug them and file a plugged and abandoned report in the Commission on those wells?

A. I am sure they did.

Q. You are sure they did?

A. That is the rule.

Q. Now, Mr. Sorenson, I believe you went over with Mr. Baker the manner in which you arrived at what you call the net effective sand. You undertake to determine the total sand by well logs and so on, do you not? By what information you have of that nature?

A. Yes, sir.

Q. That is correct, isn't it?

A. Yes, sir.

Q. Now, that sand in the East Texas field is not all Woodbine sand, is it? There is some streaks of shale and volcanic ash and other impermeable materials, isn't that true?

A. Yes, sir, the Woodbine section has some impermeable materials in it.

Q. Now, those impermeable materials don't as a rule contain oil, do they?

A. If they are impermeable they are incapable of containing oil.

Q. If they are impermeable they are incapable of containing oil, and also if they are impermeable, why, there is no oil that can go through them, isn't that true?

A. Not unless there is a well drilled through them. If there is a well drilled through them they will.

[fol. 117] Q. The oil simply won't go through those shale streaks or streaks of ash or clay or whatever else is in there of an impermeable nature, isn't that true?

A. That is true. If they are impermeable the oil cannot penetrate.

Q. Do you know what percentage of shale there is on the average throughout the field?

A. Not on an average throughout the field. We work it by areas over the entire field.

Q. Well, how does it vary throughout the field, the percentage of shale from one part of the field to the other?

A. In a given sand thickness?

Q. Yes, sir. Just take a given sand thickness in different portions of the field. What is the extent of variation in the amount of shale and other impermeable bodies in the sand?

A. In a given area, in a given sand thickness, there is very little difference.

Q. Do you mean, then, that the sand is substantially the same throughout the field, given a certain thickness of sand?

A. In a given area they are substantially the same, yes, sir.

Q. In a given area they are substantially the same?

A. In a given area or a given sand thickness the shale content will be very much the same.

Q. But if you take one part of the field and compare it with another part of the field, is the percentage of shale the same?

Judge Sibley: Ten per cent in one place and five per cent in another?

A. Yes, sir, over a great area there will be a great variance.

Q. What will the variance amount to?

[fol. 118] A. Give me the sand thickness and then I will know what areas you are talking about.

Q. Well, take this section down there that you colored in light gray on Plaintiff's Exhibit No. 5. What section of the field do you call that, in general?

A. The southern section of the field.

Q. All right. Now, what percentage of shale is in that area of the field, what percentage of total Woodbine section to shale or other impermeable material?

A. Well, a very great percentage. We can look on that electric log on the section.

Q. You are familiar with that, aren't you, Mr. Sorenson?

A. Yes, sir.

Q. Can't you give me about what that percentage would be?

A. I would rather look at the log and measure it for you. I don't want to give an estimation on something like that where we have a complete record.

Q. All right, get it and tell me how much it is of that area, if it won't take you long.

A. Almost fifty per cent.

Q. There is almost fifty per cent of the Woodbine section in that area that is shale or other impermeable materials, is that correct?

A. I used, measured, just one well, and that was where we found more shale than in any of the others, so that would be approximately right.

Q. Would that be approximately right for that area colored in gray on Plaintiff's Exhibit 5?

A. Yes, sir.

[fol. 119] Q. Now, are there other portions of the field where the percentage of shale is greater or less than that?

A. In the extreme eastern part of the field it would probably be greater than that, along the eastern periphery of the field, there is a higher shale percentage.

Q. How wide a band do you call the eastern periphery of the field? How far from the extreme east edge inward toward the center would you say was the extreme east edge?

A. Just a few hundred feet. The area of sub-marginal wells I would consider the area of the most impermeable sands in the producing section.

Q. Now, about what percentage of shale would you find in that part of the field?

A. A very high percentage of shale, impermeable sandy shales.

Q. More than fifty per cent?

A. More than fifty per cent.

Q. About what per cent would it run up to?

A. Approximately seventy-five per cent in this narrow area.

Q. Would that be about an average of the percentage of shale in that part of the field?

A. I believe that is true, yes, sir.

Q. Now, suppose you go on westward from what you call the eastern periphery of the field and get in there to where

the sand is somewhat thicker. Now, what would be the percentage of shale as you went toward the middle of the field? Would that depend on whether you were in the north end or south end?

A. The central part of the field as a whole has a very small percentage of shale.

[fol. 120] Q. About what percentage would that be?

A. If you are in the hundred foot sand section?

Q. Well, take that for example.

A. That is the thickest sand section there is, and ten or fifteen per cent shale is about all you would find.

Q. As you go eastward you would find an increasingly higher percentage of shale, is that correct?

A. Shale and impermeable sand. The sands get a little tighter to the east.

Q. All right. As you go westward would you find the shale somewhat tighter, from the center of the field?

A. No, sir, going westward the sands thin because of the bottom hole water.

Q. Well, would you find the same percentage of shale from the center, say, or the fairway where you have the thickest sand, would you find about the same percentage of shale from there on all the way to the western edge, or would there be some variation in the percentage of shale from there on?

A. Variation. The percentage of shale wouldn't be as much in the extreme western as in the extreme eastern.

Q. Is there more on the west than in the center?

A. There is more on the west than there is in the center, but not as much as in the east.

Q. About what percentage of shale would you say there is on the west side?

A. Well, I would rather measure those logs, give you what our logs show.

Q. Could you tell me about what percentage it is? I don't want to take the time to have you go into it unless [fol. 121] you would rather take that time to give the exact figure.

A. I would rather go into it and measure it. They are available.

Q. Would it take you very long to do that, Mr. Sorenson?

A. I will measure several wells for you.

Q. And will you have that information available for us?

A. Do you want me to do it now?

Q. No, I suppose not, if you can do it at a recess or tonight and let me have it in the morning.

A. I will do it any time you wish.

Q. All right. But generally speaking, from the center of the field going off toward the edges you have an increased amount of shale or other impermeable streaks? Toward the east it is more marked than toward the west of the center, is that correct?

A. That is true.

Q. Then you find the greatest permeability substantially in the center of the field, is that correct?

A. You find the greatest amount of sand in the center of the field.

Q. All right. And you find the greatest percentage of net effective sand in the middle of the field, is that correct? Or the smallest percentage of impermeable bodies?

A. That is true.

Q. Now, Mr. Sorenson, do those shale bodies that you have been speaking of have any effect whatever, in your opinion, on the free flow of oil in the East Texas field?

A. No, sir, those shale bodies are not continuous. They are of a lenticular nature and communication of the oil around them is common, as borne out by our pressures [fol. 122] in the field and the measured potentials across the field.

Q. All right, I just want to get your position. Your position is those shale streaks that exist in the field have no effect whatever upon the free movement of oil in the reservoir?

A. The only effect they have would be local, in isolated areas. As a whole, they have no effect.

Q. Now, if you don't mind, give us an idea of what you mean by their effect being just local. Over what area would they possibly affect the movement of the oil in the field?

A. The shale lenses pinch out to the ends. They are lenticular in nature and they are not over any great extent.

Q. All right, sir. Now, what area would be affected by one of those lenses? You say it would just be local. I want to get your idea of what you mean by local.

A. Well, one local lens would be affected. There would be a small percentage of sand, perhaps, in that one area.

Q. What would that area be?

A. Well, a very small area around that well, a well.

Q. What do you mean by very small area?

A. Well, you have seen those logs and they show shale streaks in those logs and they do not appear to be continuous.

Q. I have seen your cross section, yes, sir, but I want you to tell me what you mean by a small local area. If you can express it, tell me about what that area would be. Would it be one acre or half an acre or a quarter of an acre or ten acres or what?

A. With the drilling in the field as it now is we find that very few shale lenses are continuous between wells. We can't correlate those shale beds like we can correlate the [fol. 123] tops of the sands.

Q. I asked you if you can tell me what a small local area would be, what you meant by that in answer to my question. Now, can you tell me what a small local area is? What you mean by that term?

A. I think I have told you.

Q. Well, about how many acres would it be?

A. The density of a well to each five acres throughout the field and no dry holes in the field certainly shows that these shale bodies are not very important.

Q. I didn't ask you that, Mr. Sorenson. I am asking you if you can tell me, please, what you mean by a small local area?

A. If you find no dry holes in five acres it is certainly a small area.

Q. Would you say that five acres was a small area that might be affected by a shale lens?

A. Yes, that is perhaps true.

Q. All right, Mr. Sorenson, let's look at this long cross section you have. First let me ask you about this cross section. How is that identified, this one of the cross sections in Complainant's Exhibit 6?

A. GG.

Q. This is GG?

A. Indicated on the index map by these lines.

Q. Now, let me ask you about the rise in the water level which you have shown here on this map. This dotted line which I am pointing at on the cross section that I have just named is the estimated original water level, is that correct?

A. That is correct, 3,320.

[fol. 124] Q. That is 3,320 sub-sea. That is your estimate of the original water level in the field, is that correct?

A. Yes, sir.

Q. Now, the light area above that dotted line, in the western portion of the field, which I am now pointing to with my pencil, is the portion of the original oil sand which has been drowned out by water, is that correct?

A. Yes, sir, that is our interpretation.

Q. Now, as shown on this cross section map, that rise has not been horizontal, has it?

A. No, sir. That is based on productive wells in that area, and as indicated is a rise that is not exactly uniform. However, if you will draw this to scale, which would make it so long it would be impossible to bring it in, you would be unable to recognize that rise.

Q. Well, let's see about that. You have that rise in there, haven't you?

A. It was put in there from productive wells that are now making water.

Q. Those wells don't appear on this cross section, do they?

A. No, sir.

Q. You don't have any wells in this cross section showing the extent to which that water has risen in that area?

A. No, sir.

Q. Mr. Sorenson, did the presence of these shale lenses that you show running into that portion of the field have anything to do with the uneven rise in the water table in that part of the field?

A. No, sir, I don't think they were important in that area to effect the rise of the water.

[fol. 125] Q. In your judgment, they had substantially no effect on the uneven rise in the water, is that correct?

A. Yes, sir.

Q. Now, about what has been the rise in the water table, and point where is has risen highest, as shown on that cross section?

A. As shown on this diagrammatic section, it is thirty-six feet.

Q. Well, is thirty-six feet, in your judgment, does that represent the highest point, the highest extent of water encroachment in the field today or not?

A. That is the highest point in this map, but I think there are higher points in the field.

Q. Do you know what would be the highest point it would reach above the original water level?

A. No, sir, I don't know.

Q. Could you tell me the average rise in the water level?

Judge Sibley: You may have an idea about this, but what is the reason for this? We know the water is rising.

Mr. Hart: If the Court please, there have been estimates by the Humble about their depletion. They have just stated what their depletion has been, what the depletion in the field has been to date, and what their percentage of the acre-feet left is, and I want to check up on it and, if I can, see whether or not their estimates are correct.

[fol. 126] Judge Sibley: We are not going to follow you through that arithmetic. He says he will give you exactly how many wells they have abandoned. You will have a record here that no judge will read.

Mr. Hart: If the Court please, I don't know any way of checking to see whether their figures are right without getting the physical facts.

Judge Sibley: It looks like we are wasting time.

Mr. Hart: If the Court please, I will hurry along and get this just as fast as I can.

Q. Now, Mr. Sorenson, could you give us the average rise in the water table throughout the field up to the present time, your estimate?

A. It would be an approximation, something like twenty feet.

Q. About twenty feet?

A. Higher in some areas and lower in some.

Q. Mr. Sorenson, you stated that the shale streak did not have any influence on the irregular rise in the water table. What, in your judgment, did cause the irregular rise in the water table in the East Texas field? The fact that it did not rise horizontally?

A. The withdrawals of oil.

Q. The withdrawals of oil?

A. Yes, sir. That is more important than lenticular shale streaks.

Q. That is your explanation?

A. Yes, sir.

Q. Now, Mr. Sorenson, you have spoken of this eastward migration of the oil that is taking place there in the field. [fol. 127] By reason of that eastward migration there are certain portions of the field that will produce longer than other portions of the field, are there not?

A. Yes, sir.

Q. What portion of the field, in your judgment, will produce longest?

A. The highest portion on the structure.

Q. You mean the extreme eastern edge?

A. Yes, sir, the extreme eastern edge that is still within the field. I don't mean within the peripheral narrow band that had no oil in it to start with.

Q. How far east of the east edge would you say would be the last portion of the field to produce?

A. You mean west of the east edge of the field?

Q. Yes, sir.

A. Just that few hundred feet, far enough west where you get a permeable sand.

Q. You mean five or six hundred feet, something like that?

A. Yes, sir.

Q. A band running north and south five or six hundred feet west of the east edge of the field will be your judgment of the part of the field that will produce last?

A. Yes, sir. The highest part on the structure where there is sufficient sand for a good producing well.

Q. About how many net effective feet of sand are there in that section?

A. It would vary in parts of the field. Some parts of the field ten feet of sand would be sufficient to last as long as any part of the field.

[fol. 128] Q. Then in general, excluding the portion on the eastern periphery which you have spoken of, the producing life of a field is correlated to the height of the sand in the thick area? Is that true that where you have a high sand you will generally have a long producing life, and where the top of the sand is lower you will have a shorter producing life, generally speaking?

A. There is a correlation between life and position on structure, yes, sir.

Q. Mr. Sorenson, what is your estimate of the original amount of recoverable oil in the East Texas field?

A. The original estimate?

Judge Sibley: He stated that twice.

Mr. Hart: If the Court please, I don't think that Mr. Sorenson has given that.

Judge Sibley: I can't remember the figures, but he gave that.

Q. Have you stated that, Mr. Sorenson?

A. I stated the number of original acre-feet of sand in the field.

Q. All right.

A. Based on a Railroad Commission map.

Q. What is your estimate, Mr. Sorenson, of the original amount of recoverable oil in the field?

A. At what date?

Q. Well, what is your estimate as to what it is now? If you have made various estimates, tell me what they have been at different times.

[fol. 129] A. At the present time the field is drilled up completely and we know the limits of the field. The earlier estimates, then the limits of the field were unknown.

Q. Well, what is your estimate now of the original amount of recoverable oil which was in the East Texas field?

A. In the neighborhood of 5,000,000,000 barrels.

Q. In the neighborhood of 5,000,000,000 barrels?

A. Yes, sir.

Q. How much oil has been produced from the East Texas field up to date?

A. I don't have the figure with me, but it is in the neighborhood of 1,360,000,000.

Q. 1,360,000,000 barrels. Does that figure, Mr. Sorenson, that you have given include hot oil as well as allowable oil?

A. Yes, sir.

Q. That is an estimate of the total production to date, hot oil as well as oil produced under proration, is that correct?

A. The total production.

Q. Do you know how much of that estimate is hot oil and how much is allowable oil?

A. No, sir, I don't.

Q. Could you get me that figure too?

A. Yes, sir, I will make an effort to get it.

Q. Then, according to your estimate, there is left in the field today approximately how many barrels of recoverable oil?

A. Approximately 3,600,000,000 barrels.

Q. Approximately 3,600,000,000 barrels?

A. Yes, sir.

Q. I believe you say you don't have the number of acre-feet of sand in the field at this time, do you?

[fol. 130] A. No, sir.

Q. But you can get that?

A. Yes, sir.

Q. Would you then figure for me the probable recovery per acre-foot from those figures?

A. Yes, sir. It is just arithmetic.

Q. Will you figure that out and have that available too?

A. Yes, sir.

Q. Does the Humble Oil & Refining Company have today substantially the same amount of recoverable oil per acre-foot under its leases as the average of the East Texas field?

A. Yes, sir, our property is average.

Q. It would be average?

A. Yes, sir.

Q. Now, Mr. Sorenson, do you mean by that that there are the same number of barrels of recoverable oil per acre-foot, say, on the east side of the field as there is on the west side of the field?

A. As of the present time that would be right.

Q. As of the present time there are the same number of barrels of recoverable oil on the east side leases as there are on the west side leases?

A. Per foot, yes, sir.

Q. Per acre-foot?

A. Yes, sir.

Q. Mr. Sorenson, you spoke of the fact that some leases in the field would produce considerably longer than other leases. Would you estimate how much longer those last leases will produce, assuming the present method of proration?

[fol. 131] A. They will produce a great time longer. I wouldn't put it in years.

Q. You couldn't estimate about how much longer it would be?

A. No, sir.

Q. Well, would it be around in the neighborhood of thirty or forty years, something like that?

A. There will be production in the field for forty years, in some places.

Q. Do you have, Mr. Sorenson, the amount of oil that has been produced from all of the Humble leases to date?

A. I have our total production, yes, sir.

Q. All right, how much is that?

A. We have produced 131,364,982 barrels.

Q. Does that include the production from the leases which you now own? Does that include the production before you bought the leases, as well as after you bought the leases?

A. As near as we can ascertain, that is the complete production of the leases.

Q. That is the total production? There may have been somebody on it before you that ran some hot oil off. Do you include that in your estimates of how much has been produced from those leases?

A. Yes, sir.

Q. You don't know how much you estimate as being oil in excess of allowable oil, do you?

A. No, sir.

Q. Could you get that figure for me too?

A. I don't know where I would get it.

[fol. 132] Q. Well, it is easy to calculate the allowable oil from the leases, isn't it?

A. No, that is very hard to do.

Q. How did you arrive at the figure?

A. Our total production?

Q. Is that just a guess?

A. No, sir, that is based on runs.

Q. Based on runs?

A. Yes, sir.

Q. You mean a report to the pipeline? Just what did you base that figure on?

A. That is based on our production reports and pipeline runs.

Q. Production reports to whom, Mr. Sorenson?

A. By our production department.

Q. In other words, it is based on records of the Humble Oil & Refining Company, is that correct?

A. Yes, sir, and can be checked against the comptroller's record.

Q. All right. As of what date is this figure given, Mr. Sorenson?

A. I think it is June 1st, but I will have to check that.

Q. Well, will you have that information, please, sir?

A. Yes, sir.

Q. That is not of February 1, 1940?

A. No, sir, we couldn't get it.

Q. If you will let us know what that is.

A. Yes, sir.

[fol. 133] Q. Now, Mr. Sorenson, you gave us a figure of 5,000,000,000 barrels as your present estimate of the originally recoverable oil in the East Texas field. How has your estimate, or the estimate of the Humble to which you have had access, varied from that figure of 5,000,000,000 barrels during the life of the East Texas field, and if it has varied, how much?

A. The figures vary considerably, for several reasons. The number of acres involved.

Q. Well, now, before you give me the reasons, tell me what the variations have been and then if you want to explain it you can.

A. My first figure on the field, when it was a 100,000 acre field, was in the neighborhood of 4,000,000,000 barrels. That was in 1931.

Q. What was the official estimate the Humble made? They make an estimate the first of each year at their Tyler office, don't they?

A. They estimate their reserves in their annual reports, yes, sir, but I don't recall what that was.

Q. Beginning in 1933, on January 1st of each year, from now until then, there has been an official estimate gotten out by the Humble engineers, hasn't there been?

A. Yes, sir.

Q. Do you have that information available?

A. It is available, yes, sir.

Q. Will you get that for me, please?

A. Yes, sir.

[fol. 134] Q. What has been the lowest estimate of the total amount of recoverable oil in the field originally?

A. I don't know what the original estimate was. The field originally was considered to be only a few acres, a few thousand acres, and as it has been completely developed the acreage is changed.

Q. The limits of the field were fairly well defined in 1933?

A. Yes, sir.

Q. I just asked you to begin with 1933 and give me the figures of the estimates that the Humble had from then on to date; and I wish you would also give me, if you can, the figures that the Humble had on the amount of recoverable oil in its leases originally, those estimates being made on January 1st of each year from 1933 up to date. And if you have similar estimates about the acre-feet of sand I would like to have them.

A. I will get whatever I can. I will find what I can for you.

Q. Do you know what percentage, Mr. Sorenson, the Humble leases are of the total productive acreage in the field?

A. Yes, sir, 11.16 per cent of the acreage.

Q. 11.16 per cent of the acreage?

A. Yes, sir.

Q. What percentage of the allowable currently are the Humble leases getting?

A. 11.15 per cent.

Q. The figures are practically the same, are they not?

A. Those figures are.

[fol. 135] Q. Now, Mr. Sorenson, after you have determined the amount of what you call net effective sand under a lease, are there certain variable factors that will determine how much recoverable oil is in that sand or are those factors the same in all parts of the field?

A. You would have to consider position on structure and how the allocation of allowable was.

Q. Well, first in the net effective sand you have not only deducted for shale and other impermeable streaks, but you have also corrected that to a certain percentage of porosity, have you not?

A. Yes, sir.

Q. In giving your estimates?

A. Yes, sir.

Q. Now, do you have available the number of actual feet of Woodbine sand, exclusive of shales and other impermeable materials, in the Humble leases, under the Humble leases?

A. No, I don't have them with me.

Q. You don't. Well, does anybody else here have that?

A. I don't know. We have 159 leases, and if we are going to bring everything in, it will take a truck.

Q. I understand that has been turned in to the Commission, but the figures that were turned in to the Commission were not the actual number of acre-feet, but it was the number of acre-feet corrected to 26% porosity, was it not?

A. Yes, that is the way you estimate your net effective sand, reduce it to that porosity.

[fol. 136] Q. Do you have available the figures which would show the actual acre-feet of sand before you corrected it to that porosity?

A. That could be determined by the net section from a structure map.

Q. Could you do that if I gave you a list of the leases that you say have been depleted? Could you give us the actual number of acre-feet of sand, the leases you say have been depleted, if I give you a list of the leases?

A. Yes, sir.

Q. I will give you a list——

Mr. Baker: If Your Honor please, I don't want to be objecting to the line of inquiry in particular, but the company has already furnished the Commission with those reports, and here they are. He is asking this witness to make up a lot of data that would probably take two or three weeks to compile. I don't see how in the world he can compile all of that, and get them in here while this case is being tried.

Judge Sibley: I have been doing rather all of the objecting, and quite at a loss. I don't see how this court can possibly handle the details being proven. What good will it do?

Mr. Hart: If the Court please, the Humble has stated that their leases have been depleted in a certain amount, and they assert that as a basis of showing their property has been, is being confiscated. The only way their leases have been depleted, aside from a few leases on the east——

[fol. 137] Judge Sibley: The past will have to stand for itself. It is whether or not these present orders are proper or improper orders.

Mr. Hart: The only purpose—they have offered it, and they obviously think it is relevant, and the reason they think it is this. In order to determine their percentage of the present acre-feet of net effective sand in the field, in order to determine what they say they ought to get, they have got to figure how much they have been depleted in there.

Judge Sibley: They say there is just as much in there as there ever was.

By Mr. Hart:

Q. Mr. Sorenson, have you been depleted, or do you have the same amount of net effective sand in your leases that you originally had?

A. We have the same amount in the eastern portion of the field, but in the western portion we have certainly been depleted.

Q. You have been depleted to some extent?

A. Yes, sir.

Q. And you have figured out how much that depletion is, at least you have figured out what percentage of what is left you now have?

A. Yes, sir.

Q. In order to check on that figure, if the Court please, I want to find out what that depletion has been, so that I can find out how much they have left, and the only way I can do it is to find out how much sand they have left.

Judge Sibley: Of course, we haven't got to take into account the oil. We haven't got to make any orders about [fol. 138] this business, but to see whether the Commission has exceeded its powers or transgressed the Constitution, or done anything else it shouldn't have done, in dealing with these present orders, dealing with the situation as it exists today.

Mr. Hart: Yes, sir.

Judge Sibley: I can see the history of the past depreciation would be of some service in enabling us to prophesy what is going to happen under these orders in the future. If it has run out of the west and run to the east that might help us, but I really can't see how the history of the particular leases can help us. It has just bogged me down, personally.

Mr. Hart: The reason, if the Court please, we want to find out the extent of their depletion, is to find out how much oil sand they have left. They say they have a certain percentage of oil sand left. We can't find out that until we know to what extent their leases have been depleted up to this time.

Judge Sibley: And by depleted, you mean the water has invaded it?

Mr. Hart: Their depletion has been substantially all by reason of water encroachment. A certain number of acre-feet of oil sand, they say, on the west side, on the leases on the west side, has been drowned out by water. I want to check, if we can, that figure. It is a complicated matter.

Judge Sibley: You understand it better than I do, of course.

[fol. 139] Judge McMillan: Despite the fact that this water encroachment has been, has meant depletion to the

if it took a week, but if there is no reason that he isn't correct about it, and he is undertaking to dig into details that won't produce new proof, or any proof, it is trying on the patience.

Mr. Baker: The Commission has the information in hand now from which he can seek the falsity of the statement of this witness, if he desires to do so. That information is not only available, but has been available since August 8, 1939.

Mr. Hart: If the Court please, I would like to read from which Mr. Baker had in his hand to show that the Commission doesn't have the necessary information. They have an estimate here of each of their leases of the—of what they call the net effective sands, and then they have here under "Remarks," "Sand thickness given is net effective oil sand adjusted to an average porosity of 26%."

Q. Now, that meant, didn't it, Mr. Sorenson, that if your estimate of the porosity in that particular respect was far less than 26%, what you did in reporting it here was to cut down the actual feet of acre sand in order to adjust it to a 26% porosity, isn't that correct?

A. That is correct.

[fol. 143] Q. You don't state here in this questionnaire what the actual acre-feet of sand was before you made the adjustment, do you?

A. No, sir.

Q. You don't state that in there. Is there anything in here that this Commission could use to arrive at what your actual acre-feet of sand was before you made the adjustment?

A. The Commission has the records of all of the wells in the field, the production records. We used their sand thickness map and found it accurate.

Q. There is nothing in here to show what you consider to be the actual acre-feet of sand in those leases before you made this adjustment, nothing in this report?

A. No, sir, but I think you will find that report is complete. It will show what we consider is correct at this time.

Q. Well, suppose the Commission calculated what the actual acre-feet of sand was, and it was a figure of, say, only; say it was twice as much as what you have got here, or only half as much; there is no way of telling whether that is due to the fact you assigned a different porosity to the lease than the Commission did, or how you arrived at that from that questionnaire.

A. Since our sand thickness maps check so closely, I don't think there is much chance for an error. You can take the whole field,——

Judge Sibley: This gets to what I was thinking at first. If the Commission has been over this and arrived at a different conclusion from this witness, it looks so simple to [fol. 144] let whoever did that say what they think about it.

Judge Allred: If I may be pardoned for interrupting, counsel may ask this witness leading questions for the purpose of impeachment. It might facilitate matters, instead of asking for this detailed information.

Judge Sibley: I don't think he wants to impeach him. He wants to get to the foundation of this.

By Mr. Hart:

Q. Do you know what it was, the actual number of acre-feet under these leases, was, more or less, than the number of acre-feet you gave after adjusting it to 26% porosity?

A. The adjustment would be downward to bring it to the 26%.

Q. Do you know how much it was, to bring it to 26% porosity?

A No, I would have to take each of the 159 leases and check them against the map, and start over again.

Q. How long would it take you to do that, you have got the figures?

A. I can measure it in weeks.

Q. You have got the figures here, haven't you?

A. No, I don't have the figures.

Q. Did you ever have the figures before you made that adjustment?

A. I have been over the figures. That work was done by dozens of people working on it.

Mr. Hart: If the Court please, we are in this position; that they stated they have a certain percentage, and we [fol. 145] have no way of checking whether they——

Judge Sibley: It is your job to get ready to meet witnesses that don't agree with you about things. We are in the trial. This witness states in his opinion the depletion has been such and so spread that it averages just the same in percentage of what they still have in the sand. That is his opinion. He can't swear to that like somebody that saw something that transpired. He hasn't got the figures here,

and can't back his opinion up with those details, so you will have to drop it right there, as far as he is concerned, I think.

Mr. Hart: We except.

Q. Mr. Sorenson, after you arrived at the net effective sand, and you made your adjustment for porosity, whatever that is. By the way, what variations of porosity are there throughout the field? Between what—you have adjusted to 26% porosity. What variations in porosity actually are there throughout the field?

A. Very little variation.

Q. Give us the figures, please, sir.

A. It is the amount of the shale within the sand section. The porosity of clean sand would be the same, no matter what the size of the sand grains.

Q. If you take Woodbine sand, is it all 26% porosity?

A. The sand itself?

Q. No variation as to that. If you take Woodbine sand, it is all 26% porosity, is that your statement?

A. Yes, sir.

[fol. 146] Q. When you get Woodbine Sand of 26% porosity, does it all have the same permeability?

A. No, sir.

Q. What are the variations in permeability?

A. You have them on that list there. It varies considerably.

Q. Can you give us an idea of that?

A. It varies from 100 milli d'arcys, to several thousand.

Q. And depending upon whether the permeability is an important factor in determining what the amount of recoverable oil actually will be under any particular lease, is it not?

A. No, sir, the amount of oil would be the same, since the porosity is the same, but its ability to give it up, or the rate it gives it up would be influenced by the permeability.

Q. The amount of recoverable oil is affected by the permeability of the net effective sand under any particular lease, is it not?

A. It depends upon the time. If you have the time, it will still give it up.

Q. If you have a relatively impermeable lease, a highly permeable lease, is it your statement there would be the same amount of oil recovered from that sand, if you gave them enough time?

A. You say an impermeable lease?

Q. Yes, if you have one with low permeability, and if you have another with high permeability, will there be the same amount of recoverable oil in the two leases?

A. It would depend on the position on the structure.

Q. Take the same position on the structure, assuming everything except the variation in permeability, does the [fol. 147] permeability affect the amount of recoverable oil under a lease?

A. If you have enough time, the relatively impermeable area will produce the oil.

Q. Will it produce the same amount as the other lease, if you have the same sand?

A. Substantially so, if you have enough time.

Q. I think that is all for the present, Mr. Sorenson.

Mr. Baker: May I ask the witness two or three questions, Your Honor.

Judge Sibley: Yes, sir, if it is important.

Redirect examination.

Questions by Mr. Baker:

Q. Mr. Sorenson, isn't it a fact that this Railroad Commission isopach map, Humble's Exhibit No. 4, is the map that is currently used by the Railroad Commission in determining the sand thickness of the various leases in the East Texas Field?

A. Yes, sir.

Q. From that isn't it proper to conclude that the Commission believes that it can determine the sand thickness, effective sand thickness in the East Texas Field?

A. That is evidently so.

Q. You said something a while ago about oil flowing through lenses, and if I understood you correctly, you said it could flow through shale lenses when a well penetrates a lense, and flows through the well bore; is that correct?

A. Yes, sir, through the well bore.

Q. You didn't mean to say the oil could flow through an [fol. 148] impermeable shale lense, did you?

A. No, sir, I didn't say that.

Q. If there is a lense, could the oil flow around it?

A. That is true.

Q. And the fact that a lense is present doesn't mean that the area can not be drained, does it, that is, the oil sand; it doesn't mean the oil sand couldn't be drained, does it?

A. No, sir.

Q. Now, just a word—I want to ask you a question or two about the water encroachment. Mr. Hart was asking you some questions about the water apparently not encroaching on a level plane in some places, according to these diagrams. Humble's Exhibit 6, I believe, would you or not say that that would indicate that the water tends to flow up the bedding planes?

A. That section didn't indicate it was flowing up the bedding planes.

Q. Where it happens to run, say the water is flowing up the bedding planes—would you or not say it is flowing up the bedding planes because the permeability happens to be greater that way than vertically?

A. That would be true.

Q. Or directly lateral. Will you state why from time to time the estimates of recovery, the total recovery in the East Texas Field, have varied?

A. Well, they varied by the area extent of the field. As the productive acres varied, and also by the system of allocation of production. In other words, the top allowable and the system by which the field was produced.

[fol. 149] Q. Do you mean to say that as it has been produced more efficiently the estimates of the ultimate recovery have increased.

A. Yes, sir.

Q. Is it or not a fact that the actual recoveries per acre foot have been greater than was originally thought probable?

A. Yes, sir, that is true.

Q. Has that had anything to do with the increase in the estimates of recovery?

A. Yes, sir.

Q. That is all.

Mr. Moody: May I ask the witness a few questions?

Judge Sibley: All right, sir.

Recross-examination.

Questions by Mr. Moody:

Q. Mr. Sorenson, you spoke about on the east edge of the field there were places there where the sand was light, and

where perhaps there was 75% of shale breaks. Can you estimate the approximate area of that portion of the field of which you were speaking when you said that was true.

A. I stated it was a very narrow band on the eastern portion of the field.

Q. Could you give it in acres, approximately?

A. No, I can figure it for you.

Q. Just state that into the record later. It is a small per cent, is it not?

A. Very small.

Q. Very small per cent of the area of the field.

[fol. 150] Judge Sibley: Four or five hundred feet wide, and forty miles long. Anybody can figure it that is interested.

By Mr. Moody:

Q. In our opinion, from the study you have made of the field, and the acquaintance that you have had with it, is it necessary to give wells in that part of the field a flat 20 barrels per well allowable while wells in the fairway or center of the field where the sand is the thickest and most permeable are only given 20 barrels as a minimum allowable, is that necessary in your opinion to prevent the waste of oil? By waste of oil, I mean premature abandonment of wells, loss of oil ultimately recoverable, or damage to wells?

A. No, sir.

Q. That is all.

Recross-examination.

Questions by Mr. Hart:

Q. What portion of the field were you speaking of then, Mr. Sorenson?

A. The narrow band to the east.

Q. Mr. Sorenson, if the Railroad Commission started today and prorated the field from now on each month on the basis of the recoverable reserves in place, that is, assigning to each lease in the field a percentage of the total field allowable, in the same percentage that those reserves bore to the total reserves in the field, and that was carried on from now to the end of the production in the field, would,

under that method of allocation, each lease in the field get substantially the equivalent of the recoverable oil now in [fol. 151] place beneath those leases, or would some leases get much more, and some leases much less than the recoverable oil now in place?

A. As I understand, if I understand your question correctly, there would be no minimum given?

Q. Taking no minimum, and you examine—the Commission each month determined what the total recoverable reserves in the field were, and gave to each lease an allowable based on its percentage of the total recoverable reserves, would under this method of proration would—is it true or not that some leases would get much more than the recoverable oil now in place, and some much less?

A. No, it would approach the amount of that recoverable oil in place.

Q. You mean, you are taking into consideration the eastward migration of the oil, and is it your statement that under that method of proration the leases on the east side would get no more than the equivalent of the recoverable oil in place?

A. If they produced in accordance with what they have in place.

Q. Each month if the Commission allowed them to produce in accordance with the recoverable oil then in place, each period?

A. You would have to consider position on the structure.

Q. What do you mean by "you would have to consider position on the structure?" You mean by that, don't you, that if you don't give some factor, don't put some factor in the proration formula that will compensate for that eastward migration, you will necessarily have leases, say in the [fol. 152] middle and on the east, getting more than their recoverable oil in place, whereas, you will have some places on the west where they will be getting less than their oil in place?

A. That is probably true. You would have to consider position on the structure, and you haven't told me what top allowable you would consider.

Q. All right, sir.

Judge Sibley: Next witness.

Mr. Hart: May I ask you to do this, not now, but on Plaintiff's Exhibit 5 would you make an indication of that

portion of the field that you say will produce longest? You told us that, what it was, about—will you draw a line down there where you think that will be.

Judge Sibley: We are fairly intelligent. He said after you get out of the 600 foot band, to the east, ten feet of sand, east of that, would be as good as any in the field.

Mr. Hart: Is that your statement?

A. Where you have a sand thickness great enough to make a good well, sufficient sand of good enough quality, that will be the longest producing area in the field.

Q. All right, sir.

(Witness excused.)

[fol. 153] T. V. Moore, a witness produced by the Plaintiff, having been first duly sworn, testified as follows:

Direct examination.

Questions by Mr. Baker:

Q. Give your name, please.
A. T. V. Moore.
Q. Where do you live?
A. Houston.
Q. What is your occupation?
A. Research Engineer.
Q. For whom are you working?
A. Humble Oil & Refining Company.
Q. How long have you been working for the company?
A. Since 1927, with the exception of a short period.
Q. What has been the nature of your duties?
A. Since 1929 I have been in the Production Research Division of Humble's Research Department. Since 1933 I have been in charge of that work.
Q. Will you please give your additional qualifications?
A. Yes, in 1925 I received a B.S. degree from Virginia Military Institute. In 1926 I received a B.A. degree from Rice. In 1927 I received the degree of Chemical Engineer from Rice, and in 1929 I received the degree of Master of Science in Chemical Engineering from Massachusetts Institute of Technology.
Q. Have you had occasion to make a special study of the East Texas Field?
A. Yes, sir.

Q. What has been the nature of your study of the East [fol. 154] Texas Field?

A. We have made studies of the behavior of the field under the conditions under which it has been operated since it has come in. We have made studies of sources of energy in the field, the character of the sand, the nature of the fluids in the reservoir, studies of the drainage of the oil, and the effect of the various orders of the Commission upon the field.

Q. Have you studied the effect of those various orders upon Humble Oil & Refining Company?

A. Yes.

Q. Have you had free access to all of the data of the Humble Company with respect to the East Texas field?

A. Yes, sir.

Q. Are those data extensive?

A. Yes, sir, they are quite extensive.

Q. Will you briefly detail what the nature of those data are, is?

A. We have access and use the records of the Geological Department, consisting of a great mass of logs and electrical logs, core samples, core analyses in the field; we have the Production Department's records of the amount of oil produced by the field, and by the various leases in the field. We have records of the pressure and a great mass of information on the nature of the oil, gas, water, other pertinent facts pertaining to the fluid in the field.

Q. State whether or not you have studied and tried to digest all of this material?

A. Yes, sir.

Q. Have you considered the original reserves of the field [fol. 155] and the Humble's portion of those reserves?

A. Yes, sir.

Q. You heard Mr. Sorenson's testimony in that regard. Do you agree with him, or not?

A. I am in substantial agreement with Mr. Sorenson.

Q. Have you computed the percentage of, or production percentage, or field production that Humble Oil & Refining Company has produced up to this date?

A. Yes, sir.

Q. Or up to June 1, 1939, I believe?

A. Yes, sir, that is the date.

Q. What percentage of the oil produced in the East Texas Field up to that time had been produced from the Humble's leases?

A. 9.6% of the total field production.

Q. What do you find the Humble's reserves originally were, and now are?

A. Approximately 14.3%.

Q. Under that, what percentage of the accumulated field production has the Humble Company been denied an opportunity to produce, assuming that it had a right to produce in proportion to its reserve?

A. 4.7% of the field production, which is equivalent to about sixty-four million barrels.

Q. Do you mean to testify that under the orders as they have heretofore existed the Humble Company has been deprived of an opportunity to produce sixty-four million barrels of oil, assuming that it had a right to produce in [fol. 156] proportion to its reserve?

A. Yes, sir.

Mr. Hart: If the Court please, I think that is—you are making an assumption, Mr. Moore, that they should have produced each time in proportion to their recoverable reserve, each time the Commission entered an order?

A. Yes, Mr. Hart. Essentially, according to Mr. Sorenson's testimony, we have always had very close to 14.3% of the total reserves in the field. It happens that the location of our acreage was such that we have maintained that approximate percentage. Having maintained that approximate percentage, and if we were entitled to produce in proportion to our reserves, then each order should have given us approximately 14.3% of the allowable of the field, and we have failed to produce that much oil by sixty-four million barrels.

By Mr. Baker:

Q. Do you have a diagram that will show that information you have just testified to?

A. Yes, sir.

Q. Will you let us see that diagram, please.

A. On this diagram——

Q. Wait just a minute. Will you explain by whom and how that diagram was prepared?

A. That was prepared in my department.

Q. And under your supervision?

A. Under my supervision, yes, sir.

Q. And do you believe it fairly represents what it purports to represent?

[fol. 157] A. Yes, sir.

Q. Will you please explain to the Court what the diagram means?

A. In this diagram the area of this outer circle up here is proportional to our estimate of the original reserves of the field. The area of the inner circle is proportional to the remaining reserves of the field, and this ring around the outside is proportional to the oil which has been produced. Now, this segment here of the circle, is 14——

Q. Is that a wedge?

A. Yes, sir, a wedge.

Mr. Hart: We object. I understood Judge Sibley to say that the Court isn't going to undertake to correct any past inequities that may have existed, and the Court isn't going into the story of the production in the past. I understand this diagram is for the purpose of showing that under a situation where the field wasn't prorated at all for several years, and where then it was prorated under a method of proration that has now been abandoned by the Railroad Commission, that the Humble was permitted to produce only a certain proportion of the oil in the field. Now, we object to that as being irrelevant and immaterial, in that it doesn't bear on the fairness of the present order.

Mr. Baker: If the Court please, I think he touched upon this in his own examination, and we think that there is a— we can show a relation here to the present order because we think we can show by the Commission's own isopach [fol. 158] map and their own records what the extent of our depletion has been, in order that we may tell what our remaining reserves are, and we think that bears upon this case.

Judge Sibley: I didn't mean by what I said to be foreclosing any important question of law. I may be wrong in that idea. It seems to me the Commission might consider the inequities of the past, but I doubt if it would be of much importance today for the Court to say the Commission ought to have done so. They insisting that ought to be proven, and having a bearing on the case, I think we ought to admit the testimony, although we might not agree to consider it later in the consideration of the case.

Mr. Hart: Then, both sides will be permitted to introduce evidence on that point?

Judge Sibley: I hate to open up a great field of contentions and speculation.

Mr. Hart: I want to understand so that we will know upon what basis to meet them. I would just as soon meet them on that basis as any.

Mr. Baker: Your Honor, we don't contend that the oil that we have been deprived of the opportunity to produce in the past has anything to do with what we ought to be allowed to do now; but we want to present these data to the Court. I have shown from the Commission's old records that we have certain reserves in the field at this time. This helps to prove the very thing that Mr. Hart awhile [fol. 159] ago seemed to be concerned about.

Judge Sibley: I don't think past production would help us on that. All those estimates have been revised again and again. Everybody was mistaken about it.

Mr. Baker: From these data we will be able to show what we now have and to what extent our property has been depleted, and what we now have, so it is important from that issue. It is not going to take but a few minutes.

Judge Sibley: Don't take much time, because everybody seems agreed that past inequalities cannot be remedied by this Court.

Mr. Hart: The figures they have given have to do with productions from their leases, and not depletion of their leases.

Judge Sibley: Go ahead quickly and tell us what you want to show.

A. This yellow portion of this diagram here is equivalent to 130 million barrels and represents Humble's past production. This 64 million barrels is the figure I quoted a minute ago, which shows the recoverable oil which has been drained from underneath our leases and has been recovered by other wells in that field.

Judge Sibley: You are guessing at that. They say that you have as much as you used to have.

A. On a percentage basis, I believe we have; but we have lost actual oil.

[fol. 160] Judge Sibley: That red represents what you would have had if they had let you go on a schedule you say they should have.

A. One thing I would like to explain. There are some of our leases located on the east side, and throughout that side there is as much oil under the field as there ever was. All of those leases over there on the east side of the field have not lost anything by drainage, and our leases over there have not lost anything by drainage either; but on the west side of the field our leases have been drained to the extent not only of this 64 million barrels, but in addition thereto an amount of oil equivalent to this sum of 50 million barrels produced from these east side leases; so that this 64 million barrels represent only a net drainage.

Q. And that is after you have considered the amount of oil that has been gained by the Humble's east side leases it still has a net loss of 64 million barrels?

A. That is correct.

Q. Is that over the field as a whole?

A. From all of our properties in the field.

Q. Taking into consideration what has been gained by the Humble east side leases?

A. Yes, sir.

Q. Mr. Moore, you are familiar with the Commission's isopach map—this sand thickness map, Humble Company's Exhibit No. 4?

A. Yes, sir.

Q. According to that isopach map, how many acres feet of sand were originally in the field?

[fol. 161] A. 4,961 million and something.

Q. What has been the accumulated field production up to this time?

A. About 1,365 million barrels.

Q. How many acre-feet of sand in the field do you consider have been depleted up to this time?

A. One million and a quarter, or about one billion two hundred and 40 thousand.

Q. What is the recovery per acre foot?

A. These figures were based on my estimate of 1100 barrels per acre foot for production up to the present time.

Q. To June 1, 1939, what do you figure to be the remaining acre-feet of sand in that field?

A. Three billion 720 thousand, roughly.

Q. What about the acre-feet of sand under the Humble's property as of the same date?

A. Well, you mean originally? Or as of that date?

Q. Originally.

A. Originally that Commission map showed 707,770 acre-feet.

Q. What percentage is that of the whole?

A. 14.27 per cent.

Q. That is according to the Railroad Commission's map?

A. Yes, sir.

Q. What was the Humble's production up to June 1, 1939?

A. 131 million and a few barrels.

Q. How many acre-feet would be voided at the rate of 1100 barrels per acre foot?

[fol. 162] A. You mean assuming that there was no drainage?

Q. Yes.

A. And that we got just this 1100 barrels per acre foot?

Q. Yes, sir.

A. About 120 thousand acre-feet—119,400.

Q. How many acre-feet should Humble have had on June 1, 1939, if there had been no drainage from Humble's leases?

A. 588 thousand acre-feet.

Q. What percentage would that be?

A. 15.8 per cent of the remaining acre-feet.

Q. What is your conclusion from those figures?

A. I don't believe that we have that percentage of the acre-feet.

Q. What percentage do you estimate we now have?

A. I agree with Mr. Sorenson that we have about 14.3 per cent of the acre-feet.

Q. Do you or not conclude that the Humble had a net loss of so many acre-feet of sand by drainage, and if so how many?

A. About 56 thousand acre-feet of our sand was lost by drainage.

Q. What would that represent in barrels of oil?

A. That comes out 62 million barrels.

Q. At what recovery?

A. At 1100 barrels per acre-foot.

Q. Well, if those figures are correct, how many barrels of oil has the Humble lost from its lease by drainage net for every barrel it has produced?

A. For every barrel we have produced there has been about one-half barrel lost to us.

Q. Putting it another way,—for every two barrels we have produced, we have had a net loss of one barrel by [fol. 163] drainage from our property?

A. Yes, sir.

Q. Do you say that that is demonstrative from the Commission's original isopach map and the figures of production up to date?

A. Yes, sir.

Q. Now, then, if the Humble Company were now to have less—if it had now less than 14.3 per cent, would it have lost a still greater amount by drainage?

A. Yes, sir.

Q. Are you familiar with the Railroad Commission's orders of September 11, 1939; September 29, 1939; and January 24, 1940?

A. Yes, sir.

Mr. Baker: I would like at this time to introduce those orders of the Railroad Commission. I would like to introduce first the order of September 11, 1939, and the order of September 29, 1939, and the order of January 24, 1940.

(Thereupon the orders referred to above were introduced in evidence and were marked as Humble's Exhibits Nos. 8 and 8-A.)

Judge Sibley: Are there two orders of January 24, 1940?

Mr. Baker: Yes, sir.

Judge McMillan: Are those both supposed to be in effect, or does one supersede the other?

Mr. Baker: No, sir; I will introduce the other orders of the same date. There is another order of the same date.

[fol. 164] Judge McMillan: Which is effective?

Mr. Baker: Let me explain. There is a proration order of January 24, 1940, which is the proration order now in effect. It was for the month of February. At the same time the Railroad Commission issued a shut-down order for the East Texas Field effective for February, shutting down the field for 12 days out of the 29 days.

Judge McMillan: Excepting the marginal wells?

Mr. Baker: Yes, sir. And on the same date it issued a special order defining marginal wells.

Judge McMillan: Doesn't that statute provide for that?

Mr. Baker: Yes, sir. I was just introducing it for what it may be worth. I wish to introduce all three of these

orders of January 24, 1940, also. Particularly, I should like to call attention to the paragraph, Rule 23 on page 2 of the order, which sets out the bases on which the East Texas Field is prorated. I will not take time at this time to read it, because we explained that this morning. Now, Your Honors, I would like also to introduce official proration schedule of the Railroad Commission, which is effective for the month of January. This shows the allowable—for February, I mean. This shows the allowable for each well in the East Texas Field.

(Thereupon the orders of and schedules referred to above were introduced in evidence and were marked as Humble's Exhibits Nos. 10, 11, 12, and 13.)

[fol. 165] Q. Turning to the proration order of January 24, 1940, which is in effect for the month of February, what top allowable does it fix for the field?

A. 691,301 barrels.

Q. How many wells on the proration schedule producing?

A. 25,907.

Q. How many wells are classed by the Commission as marginal wells?

A. 514 wells that have a production of 6,245 barrels.

Q. Will you please state the basis of allocation and the number of barrels that will be allotted under the basis of allocation used?

A. Yes. The production from the marginal wells is not affected by the Commission's orders.

Q. About how much does that amount to per day?

A. It is a negligible quantity. It is less than one per cent of the scheduled allowable.

Q. Would 6,245 barrels sound about right?

A. I gave you that figure.

Q. Excuse me. Now, what does it allot to each well that is capable of producing more than 20 barrels per day?

A. It gets a flat 20 barrels per day plus an additional amount of oil.

Q. How many wells are there that get this flat 20 barrels per day?

A. 25,465 wells get 20 barrels a day.

Q. What percentage of the field allowable is that after deducting the marginal well allowable?

[fol. 166] A. About three-fourths of the field's allowable—74.4 per cent.

Q. Is or not that allocated to wells just because they are wells?

A. Yes, sir; every well gets 20 barrels.

Q. Does that mean that about 75 per cent of the field allowable is divided between wells just because they are wells?

A. Yes, sir.

Q. What percentage of the total field allowable does this equal?

A. About 73.6 per cent of the total.

Q. How much oil out of the schedule top allowable does that leave to be prorated between the larger wells in the field that are capable of producing 20 or more?

A. 175,936.

Q. What percentage of this is the total allowable after deducting the allowable for marginal wells?

A. 25.4 per cent.

Q. What per cent is it of the total field allowable?

A. I believe that would be around 26 per cent.

Q. The figures will speak for themselves?

A. Yes, sir.

Q. What percentage of the field allowable is left to prorate between the wells under the formula used?

A. 25.4 per cent.

Q. About one-fourth of the field allowable?

A. Yes, sir.

Q. What are the factors used by the Commission in prorating this 175,000 barrels between the 25,000 odd wells [fol. 167] in the field?

A. Acreage, sand thickness, potential, and bottom hole pressure.

Q. Just how do they use those?

A. For each well they multiply these various factors and then assign to that well an allowable which is to the field allowable as the product of all these factors for that particular well is to the sum of all those products of all those wells in the field.

Q. As a fraction, how would you state it? What would be your numerator and what would be your denominator?

A. Your numerator is the product of these factors for some particular well.

Q. Acreage, sand thickness, potential, and pressure?

A. Yes, sir. Your denominator is the sum of these products for all the wells in the field.

Q. What do you do with that fraction?

A. You multiply it by this 175,000 barrels of oil which is left out of the schedule allowable after giving the 20 barrels per well.

Q. And then is that added to the 20 barrels in order to determine what the actual allowable for that well will be?

A. Yes, sir.

Q. And the total allowable?

A. Yes, sir.

Q. Is that given just to the best properties in the field and the best wells, or is it distributed to all the wells capable of making more than 20 barrels?

[fol. 168] A. Each well gets its pro-rata part of this 175,000 barrels. Each well gets its pro-rata part of it except the marginal wells.

Q. That means a well on the east side of the field with two or three feet of sand and on a very small tract, one tenth of an acre, say, would still participate by the use of these factors just the same as the wells in the fairway with 100 feet of sand and drilled on five or seven tenths of acres?

A. Yes, sir.

Judge McMillan: Could you have this witness tonight take one well and figure it out to show specifically how this formula works?

Mr. Baker: We have those and will present them in the morning.

Judge McMillan: It would be a whole lot clearer to see it than to read it.

Q. Under the shut-down order the field has produced only 17 days in February?

A. Yes, sir.

Q. That means the average actual well allowable for the month will be only seventeen twenty-ninths of the schedule allowable?

A. Yes, sir.

Q. Does that mean that your total allowable and the amount of oil allocated on the flat basis and the amount allocated under the formula are proportionately reduced?

A. Yes, sir.

Q. Give us the actual figures quickly so that the Court can [fol. 169] get an idea of how much goes to marginal wells

and how much goes on the 20 barrels basis, and how much goes on the formula, actual average over the month.

A. Marginal wells continue to get the 6,245 barrels that they have on the schedule. The per well allowable takes 298,450 barrels; and the allowable in addition to the per well allowable is only 103,135 barrels.

Q. You mean that is the pro-rated oil?

A. Yes, sir.

Q. What percentage is that pro-rated oil of the total actual average allowable?

A. 25.3 per cent.

Q. What is the total field allowable on the average then—actual average over the month?

A. 407,830.

Q. Now, will you compare the increase in allowable to the properties in the field as a whole and to the Humble properties under the order of June 19 and under the order for February?

A. Under the order of June 19 Humble got approximately 9.93 per cent of the field allowable of 523,000 barrels or 52,000 barrels daily allowable.

Q. Now, what would it get under the present order if it received 9.932 per cent? In other words, what would it receive with the present top allowable if it were prorated under the order of June 19?

A. 68,600 barrels.

Q. How much more is that than what it got?

A. 16,600 barrels increase.

[fol. 170] Q. Is or not that due entirely to the increase of top allowable for the field?

A. Yes, sir.

Judge Allred: What percentage is that increase?

A. It would be about a 30 per cent increase—a 30 or 35 per cent increase. I have not the exact figures.

Q. You are talking now about the increase that is due to the increase in the top allowable. What percentage is that of the total increase?

A. Well, that is 66 per cent of the increase in allowable that we actually got under the order.

Q. That is the answer that you wished to give to Judge Allred, was it not?

A. I understood Judge Allred's question was—under this hypothetical set of facts what per cent of increase was it over the order of June 30.

Judge Allred: That is what I meant.
Mr. Baker: Excuse me.

Q. What is the actual allowable on the Humble under the schedule per day?
A. 77,000 barrels.
Q. That is on the days that it is permitted to produce?
A. Yes, sir.
Q. What percentage is that of the total field allowable?
A. That is 11.17 per cent of the field allowable.
Q. Now, of this increase that the Humble got under the February order as compared with the June order, how many barrels of that was due to the operation of this formula in the order of February?
[fol. 171] A. 8,400 barrels.
Q. What percentage is that of the increase that Humble got under the February order as compared with the June order?
A. That would be a 34 per cent increase.
Q. So 66 per cent of the increase is due to the increase in the top field allowable, and 34 per cent of the increase is due to the operation of the formula?
A. Yes, sir.
Q. Now, under actual production, the Humble actual production average over the month will be proportionately reduced, will it not?
A. Yes, sir.
Q. What would you say is the total that the Humble Company is losing per day in allowable production, assuming that this production should be in proportion to its reserve?

Mr. Hart: If the Court please, I object to the question in the form he stated it. You mean how much less they are getting, don't you?
Mr. Baker: That is what I meant.

Q. How much less are they getting under the present order than if that other formula was adopted? What I mean is this—The Humble, he testified, is getting 11.17 per cent of the field allowable. Assuming that it was entitled to 14.3 per cent of the field allowable, how much more per day would it receive?
A. In order to get 14.3 per cent of the allowable, our present allowable would have to be increased by 29 per cent. It would then be 88,000 barrels. The increase in barrels would be 21,600 barrels a day.

[fol. 172] Q. Now, Mr. Moore, have you considered the effect of this 20 barrels minimum on the distribution of oil in the East Texas Field between properties?

A. Yes, sir.

Q. What is the effect of that with respect to densely and less densely drilled properties?

A. It permits the more densely drilled properties to produce at a rate considerably higher in proportion to the reserve, and the less densely drilled properties are permitted to produce a lesser amount in proportion to reserve.

Q. Is that also true with respect to those wells that are on thin sand as compared with the wells on the thick sand?

A. Yes, sir; the wells in the thickest part of the field do not participate in the allowable in proportion to the reserve; and in the thin sand parts of the field those wells participate to a greater extent thar in proportion to their reserves.

Q. Now, assuming that the Humble Company is losing at the rate of 21,000 barrels a day or would get 21,000 barrels a day more if this were allotted its production in comparison with its reserve rather than on the present basis, have you estimated what that would amount to during the balance of the producing life of the field, approximately?

A. Yes, sir. You mean that assuming that an order continues in effect which continues to give the Humble its 11.17 per cent?

Q. Yes.

A. Under that set of facts the Humble would lose approximately 100 million barrels from its present reserve.

[fol. 173] Q. Could that be illustrated on your diagram over here?

A. Yes, sir.

Q. I believe that is Exhibit No. 9?

A. Yes, sir.

Q. Will you briefly explain that to the Court?

A. Yes, sir. This entire blue triangle here is proportional to Humble's remaining reserve of about 520 million barrels. Now, the lightly shaded portions in here represents the oil that Humble would have an opportunity to recover if the order was continued in effect which continually gave it 11.17 per cent of the field allowable. The loss here would be about 100 million barrels. Whereas their reserves are now 520 million barrels, why they would have an opportunity to produce some 400 million barrels, and somebody else would get the 100 million barrels difference.

Q. What percentage is that of our reserves?

A. About 20 per cent.

Q. About one fifth?

A. Yes, sir.

Q. Now, have you considered what the result would be, assuming the continuation of the present order during the balance of the producing life of the field, if the Commission month after month continued the same kind of order now in effect—have you considered that?

A. Yes.

Q. Have you made some calculations on it?

A. Yes.

Q. Do you think those calculations are correct?

[fol. 174] A. Yes, sir; they are reasonably correct.

Q. You don't say that you can figures those things down to mathematical exactness, do you?

A. No, sir; you can't do that.

Q. Are they within the range of reasonable correctness, in your opinion?

A. Yes, sir.

Q. Now, what results did your computation le-d you to?

A. They led me to believing that if the present order was continued in effect that the Humble would lose somewhere between 45 and 85 million barrels.

Q. If the present order were continued in effect?

A. Yes, sir.

Q. What would that amount to in dollars at the present value of oil?

A. Oh, somewhere from 50 to 95 million dollars.

Q. Do you believe, based on comparative reserve, that the Humble's loss will amount to that if this order or an order similar to it were continued in effect during the balance of the productive life of the field?

A. What I meant to say is that we will fail to produce the recoverable oil that is now under our property by this amount.

Q. By that amount?

A. Yes, sir.

Q. Now, what happens to that oil?

A. It is produced through other wells.

Q. Does that mean, in your opinion, that if this order or an order similar to it is continued in effect during the [fol. 175] producing life of the field that much of our reserve will be taken and given to somebody else?

A. Yes, sir.

Q. State whether or not, in your opinion the Humble has drilled sufficient wells on each of its leases in the East Texas field to produce the recoverable oil without waste if the Commission were to so adjust our allowable as to permit the Company to do so?

A. It has, yes, sir.

Q. Have you made a real study of that matter?

A. Yes, sir; a very intensive study of that matter.

Q. That is your deliberate conclusion, is it?

A. Yes, sir.

Q. Now, Mr. Moore, have you given consideration to specific examples showing how this lease operates—I mean how this order of February operates to the disadvantage of the Humble Company?

A. Yes, sir.

Q. Will you present those tables at this time?

A. Yes, sir; I have tables prepared.

Q. Let us have them.

A. All right.

Mr. Baker: Would the Court like to have copies of these?

Judge Sibley: Maybe you would like for us to have them.

Q. Now, Mr. Moore, were these tables compiled to show the actual operating effect of this order upon the allowable [fol. 176] for the leases that are indicated?

A. Yes, sir.

Q. On these various charts and tables?

A. Yes, sir.

Q. Have you checked these compilations and do you believe they are correct?

A. Yes, sir.

Mr. Baker: We wish to introduce some of these tables. There are four of them, I believe and they will be the Humble Company's next four exhibits. We have them named here Table I, Table II, Table III, and Table IV-A and Table IV-B. Tables IV-A and IV-B may be considered as one.

Mr. Hart: I have not had a chance to look these over yet. I don't know what other objections I may have, but I object to Table I, because there is no showing as to where these leases are located. Are all these Humble leases? On this Table I there is no showing of where these other leases are located, whether adjoining, or in what portion of the field

they are located. Whether they are producing more or less would not have any bearing on the Humble's recovery at all.

Judge Sibley: I understand that he wants to examine the witnesses in reference to that.

Mr. Hart: I thought he was now offering them.

Mr. Baker: I can offer them now or later.

Mr. Hart: I object to them now. I don't think they have been sufficiently proved up.

Judge Sibley: That objection is evidently good now. You will have to prove them up by the witness. This [fol. 177] seems to be a comparison of the Humble's leases in three different places with somebody else's leases.

Mr. Baker: As a matter of explanation, I will say that the Humble Company's supplemental complaint, as I remember it, gave the information contained here with respect to the particular leases. We allege that we were suffering these losses in the particular leases, as compared with the operators who were operating other leases in the vicinity, and we are merely offering this table for the purpose of substantiating our allegations.

Judge Sibley: I suppose that he can testify that he made this and that it is correct, but I will have to sustain the objections to the tables because they have not been proven or identified in any way up to the present time.

Mr. Baker: I asked him if he had checked them and found them to be correct, and he answered that he had.

Judge Sibley: But he did not say what these leases are.

Mr. Baker: We can identify them on the map.

Judge Sibley: That is his objection, that you have not asked him about them.

Mr. Baker: I will withdraw the introduction of these at this time and shall introduce them later.

Q. What does this Table No. I purport to show, Mr. Moore?

A. This Table No. I gives three examples for comparison between the allowables on the Humble's leases and near-by leases. It shows the lease and the location of the lease, the number of wells, the productive acres in the lease, [fol. 178] the sand thickness, the number of acre feet of sand, the daily allowable, and the allowable per day per 100 acre-feet of sand, and the ratio of the allowable of the near-by leases per 100 acre-feet of sand to the allowable of the Humble's leases per 100 acre-feet of sand.

Q. Take the illustration No. 1 here. Will you tell what leases are compared and where they are located?

A. Yes, sir. Do you want me to point them out on the map?

Q. Yes. Mr. Hart seems to want it done.

A. This first example is the Humble's Killingsworth lease in the Hathaway & Ferguson Survey. It is this lease right here (indicating).

Q. Where are the other leases that it is compared with?

A. It is compared with four other leases—not necessarily offset leases, but leases located in the same general vicinity. One is the Yeager & Schubert Finley-Thomas lease in the C. Alexander Survey.

Judge Sibley: You are not claiming natural drainage for these, but simply showing unequal application of the order, as I understand it?

A. Yes, sir.

Q. Just tell us the surveys. It will take us some time to locate them on the map. You will notice it gives the name of the lessee and the lessor and the location of the lease in the survey.

Mr. Hart: Mr. Moore, how far are those two leases apart?

A. In that particular case they are probably about two and a half or three miles apart.

[fol. 179] Mr. Hart: We wish to object to this line of testimony as being irrelevant and immaterial. You could pick out examples in any field where certain inequalities exist if you adopt a certain standard, and we object to this as being a waste of the Court's time and accomplishing nothing.

Judge Sibley: It does look like the Humble's complaint would have to be with reference to the whole field, as they are hurt whenever they fail to get what they ought to get with reference to the whole field.

Mr. Baker: We say, taking it over all, we are hurt, and we are endeavoring to show wherein we are hurt and to what extent. Not only that, but we say that this order in its operative effect is discriminatory against the Humble on the west side, and in the fairway, or on the east side; and furthermore, we say it is discriminatory against the Humble Company in that more oil is given the densely drilled area than to the less densely drilled area.

Judge Sibley: You might pick out thirty or forty leases favored by the operation of this order, and they might come back and pick out as many more that were not.

Mr. Baker: We can show these as specific examples. I think this is pertinent because they are producing from the same oil field under the same order, and it shows that from the same oil field these other people are getting anywhere from three to twenty-four times per 100 acre-feet more oil per day than the Humble is permitted to produce from its leases in the same field. We are offering this to [fol. 180] show the discrimination as effected by this order on the Humble Company.

Judge Sibley: Well, it might be permissible to show extreme cases, but I don't think you can win your case there.

Mr. Baker: We don't rest our case on this alone. This is just one of many things that we say is pertinent in order to show how this order operates and its effect upon the Humble Company.

Mr. Hart: We object to it as being irrelevant as proving the ultimate issue. In any field as vast as that, you can pick out any number of inequalities, and we could pick out any number of cases where the Humble is being favored.

Judge Sibley: I don't think we could get anything from that except that the order is not operating evenly. We will recess until tomorrow morning.

(Thereupon, at 5:00 o'clock P. M. Tuesday, February 13, 1940, the hearing was recessed until 9:00 o'clock A. M. Wednesday, February 14, 1940.)

[fol. 181] Wednesday, February 14, 1940

Morning Session, 9:00 A. M.

T. V. Moore, a witness called by plaintiff Humble Oil & Refining Company, resumed the witness stand, and continued his testimony as follows:

Direct examination continued.

Questions by Mr. Baker:

Judge Sibley: Proceed, Mr. Baker.

Mr. Baker: If the Court please, we were offering in evidence some tables here that were designed to show the

over-all effect of this order on the field. I think the tables show a two-fold purpose: One is to show the over-all effect in the field and in different parts of the field; and the other is to show specific instances of the effect that the order has upon the plaintiff. That is important, because we say we had an over-all loss. We have suffered an over-all loss; and we are suffering an over-all loss; and we will continue suffering an over-all loss; and those over-all losses must be made up of specific instances; and here are specific instances which will go to substantiate what we say there, and at the same time show the effect of these well densities, and show the effect of the order with relation to different parts of the field. I don't see how in the world we can make our proof complete unless we can introduce tables of this kind to show how the order actually operates.

Judge Sibley: Any objections?

Mr. Hart: Yes, sir. We make the objection that the [fol. 182] Humble cannot show injury to itself by showing inequalities as between its properties and certain other leases two and a half or three miles away from it. The only way they can establish they are being injured by this order is by showing by the over-all picture that they are not getting their fair share of the oil. In any field this big you can find examples of inequalities, and picking out individual cases where they say they are hurt simply clutters up the record. There is no proof in this first table that these leases will have any actual effect on the drainage of any of their leases; and the effect of that is to give an erroneous and inaccurate impression, and it does not go to the real issue in the case.

Judge Sibley: The basis of the comparison is the actual capacity of the several leases?

Mr. Hart: No, sir; it is not capacity at all. They pick a special method of comparison. They pick an acre-foot of sand method of comparison, and then compare it on that basis.

Judge Sibley: That is what I mean,—the oil that is supposed to be under the lease, according to the amount of oil-bearing sand under that lease?

Mr. Baker: Yes, sir.

Judge Sibley: Doesn't that get down to this—if that is the sole thing to be considered, then this order evidently operates unequally, because it only computes one-fourth of the oil on that basis, and three-fourths is distributed on

a per well basis. The fundamental basis of the order is that [fol. 183] then, and if that is the basis on which proration would be effected, it is self-evident, then, the order would have to fall.

Mr. Baker: We can't make our picture complete unless we can show the effect of this order on us.

Judge Sibley: Yes; you will have to show injury.

Mr. Baker: It will show injury to drainage.

Judge Sibley: I think it is self-evident that the order does not follow that basis, but that it puts the per well idea in it very largely.

Mr. Baker: We can show proof of its operative effect.

Judge Sibley: The operative effect is due to the fact that wells are more densely drilled according to the oil sands on these leases that you compare with.

Mr. Baker: That is part of it, and part of it is due to the fact——

Judge Sibley: I think you are entitled to prove it, but I hope you won't put too much time on it, because the thing is self-evident.

Mr. Baker: I think we can expedite it a great deal. My only purpose is to introduce it generally, and let Mr. Moore show these comparisons, and I don't think it will take but a short time.

Judge Sibley: I expect you are entitled to give the illustration, but cut it short.

Q. Mr. Moore, I believe yesterday you said you had examined these statements and that you had checked them against the data from which they were compiled, and that they, in your judgment, are fair representations of what they purport to represent. Is that correct?

[fol. 184] A. Yes, sir.

Q. Mr. Moore, will you explain Table No. I—briefly explain it, and then read off these ratios in the right-hand column, and make it as brief as you can.

A. This table shows for three different areas in the field the conditions about a lease of ours and several typical leases in the general neighborhood. They are not necessarily offset leases, but may be a mile or two away. It shows in this example picked in the Longview district there is another lease, not a Humble lease, which gets 3.8 times as much oil in comparison to its reserve daily as the Humble; that another gets 18.2; another gets 3.6; and

another, 6.7 times as much as the Humble gets, in comparison with its reserves. Examples are given in the Kilgore district in which a well gets 8.8, and 20.4, and 3.7, and 9.9 times as much as the Humble gets. The third example shows the same type of data in the Henderson district, showing examples of other leases getting 3.6 and 24.1 times as much as the Humble gets.

Q. Where is the Longview district? In what part of the field?

A. That is in the northern part of the field.

Q. Where is the Kilgore district?

A. About in the middle.

Q. Where is the Henderson district?

A. That is in the southern part of the field.

Mr. Baker: I would like to introduce this Table No. I as Humble's Exhibit No. 14.

(Thereupon, the Table referred to above was received [fol. 185] in evidence and marked as Plaintiff Humble's Exhibit No. 14.)

Judge Sibley: These leases that you are comparing your leases with, are they similarly situated on the structure, with reference to the probable length of time they will produce?

A. Approximately. Not exactly, but very closely.

Q. Take Table No. II, and state to the Court what it shows.

A. This shows similar examples for offset leases,—not leases in the general vicinity, which may be two or three miles from our lease with which we are comparing,—but it shows the same type of data on leases adjacent to our leases; and we have several examples here in the Longview district. One shows three offset leases which are getting 1.5, 1.9, and 1.5 times as much oil in comparison with reserves as the Humble is getting. Another example shows from 1.4 to 2.9 times as much. A third one shows from 1.5 to 4 times as much. And a fourth one here shows from 1.8 to 8.5 times as much. Then in the Kilgore district there are three examples given. In one case offset leases get from 1.3 to 2.3 times as much as the Humble gets; in another, from 3.6 to 27.3 times as much as the Humble gets; and then in another one, from 1.6 to 37.8 times as much as the Humble gets. In the Henderson district two examples are

given, one of which shows offset leases getting 2 to 3.6 times as much as the Humble gets; and the other shows from 1.4 to 4.1 times as much as the Humble gets.

Mr. Baker: I would like to introduce this Table No. II as Humble's Exhibit No. 15.

[fol. 186] (Thereupon, the Table referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 15.)

Q. Mr. Moore, take Table III and tell us what it shows.

A. Table III illustrates the effect of well density on the operation of this order. It shows the number of wells which have been drilled on tracts, ranging from zero up to .49 of an acre in size. It shows there are 159 wells on such tracts. It presents the pertinent data on these tracts, and shows the daily allowable in barrels per hundred acre-feet of sand average for all the wells on this size tract here 204.1 barrels. Wells drilled on tracts between .50 and .99 of an acre get an average allowable of 68 barrels per hundred acre-feet of sand. From 1.00 to 1.49 acres they average 43 barrels per hundred acre-feet. From 1.50 to 2.00 acres they average 29.6 barrels per hundred acre-feet. The Humble's properties averaged 10.9 barrels per hundred acre-feet of sand, and the average for the entire field, excluding the Humble's properties, was 14.4 barrels per hundred acre-feet of sand.

Q. This shows, in effect, then, that the allowable production is in inverse ratio to density, is that correct?

A. Yes, sir; almost.

Q. Almost in that proportion?

A. Yes, sir.

[fol. 187] Mr. Baker: We introduce that Table in evidence.

(Thereupon, the Table referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 16.)

Q. Explain Table No. IV-A, Mr. Moore.

A. This Table No. IV-A is a table which illustrates how the west edge and the east edge are given greater allowables in proportion to their reserves than the fairway. This data is also presented on a chart, but it shows here that for a number of actual examples, that the allowable ranges from 38.7 on the west edge, and gradually decreases

as the sand thickness increases to 8.30 in the center of the field, and then increases again until on the east edge it has gotten up to 46.03 barrels per hundred acre-feet of sand.

Q. Is that a gradual range of decrease from each edge of the field down to the center of the fairway?

A. Yes, sir.

Q. Does this chart show that the allowable is practically in inverse ratio to the sand thickness?

A. Yes, sir.

Q. The thicker sands get a great deal less per acre-feet than the thin sands?

A. Yes, sir.

Mr. Moody: Those are all based on one well to five acres, aren't they?

Q. What is your density there? Is it approximately one well to five acres?

A. It is not exactly that. The figures that I just quoted were actual examples, and the drilling density of the ex- [fol. 188] amples ranges from 4.43 acres per well up to 5.86, I believe is the highest.

Q. Why were tracts of this density selected?

A. Because they were in the approximate range of the average well density of the field.

Q. That is designed, then, to show what happened as between the east edge and west edge and the fairway under practically average conditions?

A. Yes, sir.

Mr. Baker: I would like to introduce this table in evidence as Humble's Exhibit No. 17.

(Thereupon, the Table referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 17.)

Q. Now, explain Table IV-B, Mr. Moore.

A. Table IV-B is very similar to Table No. IV-A; the only difference between the two is that instead of quoting the exact allowables from the schedule as we did in Table IV-A, we put all of these examples on a comparable basis and figured what the allowable would have been if they had all been drilled to a well density of exactly one well to five acres.

Q. What do your figures show as to the allowable per hundred acre-feet per day?

A. It shows essentially the same thing as Table IV-A, ranging from about 41 barrels on the west edge, and decreasing as the sand thickness increases, until in the fairway it reaches 8.62 barrels per hundred acre-feet, and then increases until on the east edge it is up to 41 barrels per [fol. 189] hundred acre-feet.

Q. Then, on the west edge and on the east edge the recovery per acre-foot per day on comparable five acre tracts, would be about eight times as much as in the middle of the fairway?

A. No, sir; five times as much.

Mr. Baker: I wish to introduce that as Humble's Exhibit No. 18.

Thereupon, the Table referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 18.

Q. Have you prepared a chart that illustrates graphically the data in the last two tables?

A. We have such a chart here, yes, sir.

Q. Who prepared this chart?

A. That was prepared in our Geological Department from these tables.

Q. You are familiar with the chart?

A. Yes, sir.

Q. You have studied it, and know what it purports to represent?

A. Yes, sir.

Q. And will you say whether or not, in your opinion, that is a fair representation of what it purports to represent?

A. Yes, sir; I believe it is.

Q. Will you please explain it to the Court?

A. This green and blue figure at the bottom is a diagram-atic cross-section of the East Texas field.

Q. Explain that a little further, Mr. Moore, about the [fol. 190] diagram-atic cross-section.

A. This green portion of the chart illustrates the oil-bearing section in the field. Above this oil-bearing section is the impervious rock which serves as a trap for the oil. Below is the impervious rock which represents the lower limit of the oil sand; and the blue over here shows the approximate position of the water table originally, showing how in the western half of the field the oil-bearing sand is underlain by water, and how the thickness of the oil-bearing

section is very small on the west, and increased to a maximum in the center of the field, and then again decreases to the east.

Q. What does that show about the slope of the structure?

A. It shows the slope of the structure as very flat.

Q. Which way is it inclined?

A. It is lower on the west and higher on the east.

Q. The highest elevation in the field, then, is on the east side?

A. Yes, sir.

Q. Explain the other part of the chart.

A. These colored figures on the top row present the essential data for each of these typical wells which were selected throughout the field. The green line represents the thickness of the sand in each of these wells, showing it to be thin on the east, increasing to a maximum of about 100 feet in the center, and decreasing again to about 10 feet in the case of this Grace Oil Company's well on the extreme west. The yellow line here shows the daily allowable which each of these wells is granted on the schedule. This daily allowable increases a little bit from a little over 20 on the [fol. 191] extreme east up to about 45 in the fairway for this well with 100 feet of sand, and decreasing again to a little over 20 for this well with 10 feet of sand.

Q. Does that represent the actual condition as it existed with respect to the wells that you show in these tables?

A. Yes, sir.

Q. Which table was that?

A. Table IV-A.

Q. What do the red lines show?

A. The red line shows how the allowables in proportion to the reserves, vary from about 40 barrels per unit of reserve down to about a little over 8 barrels per unit of reserve.

Q. Where is the greatest amount of production in proportion to reserve?

A. On the west and east edges.

Q. Where is the lowest?

A. In the fairway. This well with 100 feet of sand has the lowest. These diagram-atic tanks and wells here illustrate that same data, showing in another way the daily allowable granted per unit of reserve for this row of wells,

showing that those on the edges, it is approximately five times as great as it is in the center of the field.

Q. Now, going back to that cross-section of the East Texas field.

A. All right.

Q. That is drawn to scale, is it?

A. It is drawn to scale, but the vertical and horizontal scales are different.

[fol. 192] Q. Why are they made different?

A. Because if the horizontal scale were made the same as the vertical scale on this map, we would have a cumbersome chart that would probably go thirty or forty feet out here. It would be entirely too cumbersome and too long a chart.

Mr. Baker: I would like to introduce this chart as Plaintiff Humble's Exhibit No. 19, and will ask that it be marked.

(Thereupon, the chart referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 19.)

Q. Have you considered some hypothetical cases to show how this present order for the East Texas field would work?

A. Yes. You mean with respect to well density?

Q. Yes, sir; with respect to well density.

A. Yes, sir.

Q. Consider two adjacent leases on the west side, each of them having five acres, and each having ten feet of sand, and one of them having one well, and the other having five wells on it. What do you find will be the allowable for one tract, and the allowable for the other tract, assuming 450 barrels per hour potential and 1125 pounds per square inch pressure?

A. The tract with one well would have 21.1 barrels per day allowable, and the tract with five wells would have 101.1 barrels per day. They are typical west side tracts.

Q. Practically five times more?

A. Yes, sir.

[fol. 193] Q. Do you mean to say those tracts would have the same acreage exactly?

A. Yes, sir.

Q. And they would have exactly the same amount of acre-feet of sand?

A. Yes, sir.

Q. And the same pressure and the same potential, and yet, one tract would get five times as much as the other under this allowable?

A. Yes, sir.

Q. We will consider two adjacent leases in the fairway, each having five acres, each having 90 feet of sand, each having a potential capacity of 1000 barrels per hour, and each having 1075 pounds per square inch pressure; but one tract has one well on it, and the other tract right alongside it has five wells on it. Have you computed what the allowable would be under this order for each of those tracts?

A. Yes, sir. The tract with one well would have an allowable of 40.4 barrels, and the tract with five wells would have an allowable of 120.4 barrels.

Q. What is the ratio?

A. About three to one.

Q. You mean to say those tracts are lying right together in the fairway, each has five acres, and each has the same sand thickness, and the same pressure, and the same potential?

A. Yes, sir.

Mr. Hart: I object to this line of questioning, because there is no proof of any such situation existing in the field. [fol. 194] It is assuming something that does not actually exist.

Judge Sibley: That is really self-evident argument; but just as long as the thing is not prorated on the things that you contend for, of course, these differences exist. The question we have before us is whether you are right in saying that the existence of the wells ought to be disregarded.

Mr. Baker: I will not prolong the matter.

Judge Allred: Is the real vice in this order, as you see it, the fact that you are not receiving sufficient consideration for undrilled acreage in the allowable?

A. I don't understand what you mean by "undrilled acreage".

Judge Allred: That you are not receiving consideration for acreage.

A. Not acreage alone; for reserves.

Judge Allred: What goes into the reserves besides acreage? You have been giving these illustrations of wells on

the west side, one well of five acres having an allowable of about 21 barrels.

A. Yes, sir.

Judge Allred: And five wells on five acres having an allowable of 105 barrels.

A. Yes, sir.

Judge Allred: Isn't the vice that you complain of the fact that the Commission has not allowed the Humble additional production for the five acres, although it has only one well on it, but has allowed production to the same size tract with five wells on it—five times as much production?

[fol. 195] A. I believe that is correct. Here is what will happen under the order,—that we will not be able to produce the recoverable reserve now under our properties under this order.

Judge Allred: Unless you drill additional wells.

A. If we drilled down to a well density which was greater than the average for the field, then we could recover the oil, but we have not drilled our properties that densely.

Judge Allred: Has the Commission allowed you to drill all the wells that you wanted to?

A. I don't know.

Mr. Baker: Your Honor, we have a comparable picture for a well on the east side, but it is similar to the one on the west side, and I will not take time to put that in.

Q. Have you prepared some charts or had some prepared, showing the ratio of the difference in allowables for different tracts under different conditions?

A. Yes, sir.

Q. Will you show us those charts, please?

A. This chart shows the well density and distribution of oil among the various leases in the field which are comparably located on the structure. By "comparably located on the structure", I mean that if they had all been drilled to the same well density, they would have all obtained the same ultimate recovery in proportion to their reserves.

Q. Who prepared that chart?

A. I did. It was prepared under my supervision.

Q. You feel that it accurately represents what it purports to represent?

[fol. 196] A. Yes, sir.

Q. Explain the chart to the Court, please.

A. Each of these squares represents a lease in the East Texas field along a section which I believe is comparably located on the structure. The width of each of these rectangles is related to the size of the lease. The height of the rectangle shows the proportion that the recovery from the lease and the current allowable bears to the average recovery and the average current allowable of all the leases similarly located on the structure. The yellow rectangles here are the Humble leases; the green are the leases of others.

Q. What area is that in?

A. This is through the John Johnson lease, in the Thompson, Allen, and Willie Goodwin Survey. It is around Gladewater somewhere.

Q. What does that show?

A. It shows that one of these leases—in this particular chart it shows that the Humble-Della Johnson lease will get 84 per cent as much oil as the average lease similarly located on the structure. It shows varying larger recoveries for larger leases, the highest being the T. W. Lee, one well on a half acre, which produces 99.3 per cent as much as the average lease.

Q. What are some others? Read these as fast as you can. You had all of these charts prepared, did you not?

A. Yes, sir.

Mr. Baker: I would like to introduce that as the Humble's next exhibit.

[fol. 197] (Thereupon, the chart above referred to was received in evidence and marked as Plaintiff Humble's Exhibit No. 20.)

Q. Now, rapidly state what that chart represents—what that is, and what it represents.

A. This is another chart through the north end of the field, showing essentially the same data and same comparison in a different area of the field. In this case it shows the leases will recover from 55, the lowest, and it happened that that was also a Humble lease, and different leases will recover varying amounts of oil up until this particular lease, the Canadian Production Company-Christian, it will get 706 per cent.

Mr. Baker: I would like to introduce that as Humble's Exhibit No. 21.

(Thereupon, the chart referred to above was received in evidence and marked as Plaintiff Humble's Exihibt No. 21.)

A. This is another example. I believe this is also up in that general area, a little more to the east than the others. It shows examples ranging from 89.8 per cent, the lowest, the Gulf lease, which will get only 89.8 per cent of the average, and a lease over here which will get 2670 per cent of the average.

Q. Which lease is that?

A. That is the Francis Oil Company lease.

Mr. Baker: I would like to introduce that as Humble's Exhibit No. 22.

(Thereupon, the chart referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 22.)

[fol. 198] Q. Explain that, Mr. Moore.

A. This is another one. This is through the Kilgore area, which shows essentially the same data, the lowest one being the Humble Oil & Refining Company Peterson lease, which will get 8.35 per cent, and the highest being the Hamilton Smith Culp, which will get 4910 per cent.

Mr. Baker: I would like to introduce that as Humble's Exhibit No. 23.

(Thereupon, the chart referred to above was received in evidence and marked as Plaintiff Humble's Exhibit No. 23.)

Judge Sibley: How large is that lease?

A. Five wells on .52 of an acre.

Judge Allred: How large is the Humble lease that you gave us?

A. Eight wells on 50 acres.

Judge Allred: Doesn't it all come to this—since three-fourths of the top allowable is on a per well basis and only one-fourth on these other factors, that every time you get a lease five times as densely drilled as some others, it will shoot way up?

Mr. Baker: These are the same kind of charts. There are two more of them, and then we will be through with this.

Mr. Hart: We renew our objection to all this. We will admit that you can find extreme examples of dense drilling

on the Humble tract, as well as anybody else's. They did not pick out examples where they were favored.

Judge Sibley: I think it is self-evident how the thing will work.

[fol. 199] Mr. Hart: It is just cluttering up the record.

Judge Sibley: Yes, sir; but I think he is entitled to prove the consequences; but I do think they are pretty evident without the proof.

Mr. Baker: I want to rush along.

Q. Mr. Moore, will you introduce the next two, and state whether they reveal the same conditions, except more so?

A. Yes, sir.

Mr. Baker: We will introduce these two exhibits next.

(Thereupon, the charts above referred to were received in evidence and marked as Plaintiff Humble's Exhibits Nos. 24 and 25, respectively.)

Q. Whose leases in those exhibits show the greatest comparative recovery?

A. In this one it is the Steadman Thrasher Birdsong lease; and this one, it has several leases of F. W. Fischer.

Q. That is the Mr. Fischer who is one of the plaintiffs in these cases?

A. I believe that is right, yes, sir.

Q. Those will be Humble's Exhibits Nos. 24 and 25?

A. Yes, sir.

Q. Now, Mr. Moore, will you state what there is in this order, in your opinion, that causes all these disparities that you have described here.

A. The fact that three-fourths of the allowable is distributed on a per well basis.

Q. What factors in the formula give way to sand thickness, acreage, and position on the structure?

[fol. 200] A. One-fourth of the allowable is allocated on those factors.

Q. One-fourth of the allowable is allocated on those factors?

A. Yes, sir.

Q. Now, this per well allowable of 20 barrels per day does not give any weight at all to to those factors, does it?

A. No, sir.

Q. What is the effect of the 20 barrel minimum on production of wells on the west side, as compared with the fairway and as compared with the east side?

A. It permits the west side and the east side to produce at a much greater rate, in proportion to the reserves, than the fairway.

Q. Which side of this field is going to produce the longest under efficient operation?

A. The east side.

Q. Will it produce longer than the fairway under efficient operation?

A. Yes, sir.

Q. Will you state whether or not in your opinion under this order the leases in the Fairway which are drilled to approximately the average density can ever recover the equivalent of the reserves under it?

A. I don't believe they will.

Q. Why is that?

A. Well, for two reasons: one of them is that currently the Fairway receives a comparatively lower allowable in proportion to its reserves; the other, that there may be some appreciable drainage from the Fairway, to the east side.

[fol. 201] Q. To what average density are the Humble's leases in the east half of the field drilled?

A. On the east half of the field—that is, east of the water level, of the intersection of the water level with the bottom of the Woodbine they are drilled to—let's see, I believe I have lost a note I had on that, but it is approximately 4.8.

Q. I am talking about the Humble's leases now.

A. Oh, the Humble's leases are drilled to 6.18 acres per well.

Q. That is on the average?

A. Yes, sir.

Q. Now, to what average density are the leases of other operators of the east half of the field drilled?

A. 4.66 acres per well.

Q. Now, what effect does this order have on the Humble's east side leases as compared with other east side leases similarly situated?

A. Well, it means that Humble will only be allowed to produce about 75 per cent as much oil in comparison to its reserves as other east side leases will.

Q. And as compared to——

A. That is, Humble's leases on the east side will only get about 75 per cent as much proportion as other leases on the east side.

Q. Well, which side of the field under this order is the most heavily favored?

A. The east side.

Q. Why is that?

[fol. 202] A. It is a natural result of the effect of the operation of the water drive in that field.

Q. Well, does th- 20 barrel minimum have anything to do with it?

A. Yes, it does because in addition to the natural advantage that the east side has by virtue of having a longer producing life, why, it also gets a current allowable that is greater, in proportion to its reserves, than the average for the field, due to the 20 barrel minimum.

Q. In your opinion, can uncompensated drainage from Humble's leases ever be avoided on the average under the existing order or any order similar to it?

A. No, sir.

Judge Sibley: Unless you drill more wells?

A. Unless you drill more wells and unless at the same time nobody else drilled any more wells, and we would have to drill down below the average density of the field, and nobody else would drill any more wells.

Q. The important thing—isn't it a fact that the important thing in density is not density per surface acres, but density per acre-feet?

Mr. Hart: If the Court please, we object to his leading his own witness. I think Mr. Moore is a willing witness and I haven't objected so far, but when he puts it——

Judge Sibley: Of course, reserve depends on both facts.

Mr. Hart: Yes, sir.

Q. Have you computed what per cent of the Humble's allowable—what fair allowable the Humble would receive under the formula, if there were no per well minimum?

[fol. 203] A. Yes, sir.

Q. What percentage would they receive?

A. 14.6 per cent.

Q. What relation does that bear to its reserves?

A. That is very close to its reserves.

Q. Well, now is that just an accident or why is it that it happens that way, that if the formula were applied to all of the production rather than to just a fourth of it, that

the Humble's allowable would almost—the same as its reserves?

A. Well, that formula used by the Railroad Commission does distribute the oil substantially on the basis of the reserves, with certain modifying factors which allow the west side to produce a little bit faster than the east side and because——

Q. Why so?

A. I don't know why they put that in there.

Q. No, I mean what factors allow the west side to produce a little faster than the east side?

A. The factors of pressure and potential, and the fact that they use original acre-feet of sand rather than current acre-feet of sand.

Q. All right. Proceed.

A. Well, now, our leases are so widely distributed in the field that we have west side leases and middle leases and also east side leases, that the effect of these modifying factors about cancels out, and, therefore, we get under the formula part of the order an allowable approximately in proportion to the reserves.

[fol. 204] Q. Would most of the field or not experience the same result if the Railroad Commission were to see fit to apply the formula to all of the production rather than to a part of it?

A. Yes, sir.

Q. Well, how about the west side leases?

A. The west side leases would be allowed to produce currently at a higher rate than leases of the same reserve on the east side, but at the same time the west side leases would have a shorter life, so that these factors in the order which tend to give a temporary advantage to the west side would also tend to make the ultimate, as well as the current allowable, come out in the approximate proportion of the reserves.

Q. Well, do you think that the west leases really would recover their reserves on account of the time factor or not?

A. I don't believe that they ever would get quite their full reserve.

Q. Is there any way that the Commission—of course, the Court hasn't got to write an order for the Commission, but in order to determine whether a reasonable order could be entered I am asking this question: is there any way that these same factors could possibly be applied by the Com-

mission and overcome any possible disadvantage to the west side leases?

A. I don't believe—that is, I believe that under any practical order which provides for efficient operation of the [fol. 205] field, the west side of the field will almost suffer some drainage toward the east side.

Q. Mr. Moore, I think I want to ask you about one more question, a number of wells have been abandoned on the west side of the field and on the extreme east side, have they not?

A. Yes, sir.

Q. Do you or not consider that the abandonment of these wells has caused or would cause waste?

A. I don't believe it has brought about any waste.

Q. Well, why do you say that?

A. On the east side the area surrounding those wells has been affected by drainage not only from the wells in its immediate vicinity but also from all the other wells to the east of that, and the field has just produced enough oil so that the water has advanced to such points that substantially all of the recoverable oil has been recovered from certain areas over on the east side of the field.

Q. The east side or the west side?

A. I mean on the west side of the field; and that was brought about not by the particular well which had been abandoned, but by drainage from all the wells in the field.

Q. Well, if there are other wells in the vicinity, state whether or not in your opinion those other wells ought to be able to produce any oil that may remain and thereby avoid waste?

A. Well, I don't believe there is any oil that remains to be drained—any recoverable oil remaining to be drained but if there is any, why, I believe it will be recovered by other wells.

[fol. 206] Q. Well, suppose there are other producing wells in the vicinity of the well that has gone dead; now, would those other wells, in your opinion or not, produce the oil?

A. Well, the oil would be recovered from some wells; I can't say exactly which particular wells will get it, but it will be recovered.

Q. Is that because of the maintenance of pressure and the flushing effect of water?

A. Yes, sir.

Mr. Baker: I believe that is all.

Mr. Fischer: I would like to ask the witness some questions, if Your Honor please.

Cross examination.

Questions by Mr. Fischer:

Q. The Humble offered in evidence yesterday the proration schedule for February, and I will refer to it, as to the allowable allowed my wells. Now, I want to read from the Railroad Commission's pro-ration schedule for the East Texas Field dated September 1, 1939, which shows the producing capacity of all the wells in the field, and it shows my wells as follows: On the Eaton consolidated lease, which has seven wells, from 800 to 810 barrels per hour; on the Eaton B, which has 23 wells, from 750 to 805 barrels per hour; on the McElroy lease, which has three wells, from 705 to 710 barrels per hour; on the Wilson A lease, which has 10 wells, from 805 to 810 barrels per hour; on the Wilson B lease, which has five wells, four wells on that,—from 810 to 820 barrels per hour; and on the Wooley lease, with one well, 810 barrels per hour. Since this schedule was [fol. 207] made up, I drilled one other well on the Oddfellows lease, which also has a potential of 810 barrels per hour, making a total of 49 wells. Now, Mr. Moore, I would like to ask you a question or two about my case, and then I want to ask you a question or two about what you have been swearing to here. A pumping well isn't as good a well as a flowing well, is it?

A. Usually it is not.

Q. Well, you know that pumping wells in East Texas are not, don't you?

A. In general, they are not.

Q. They are not as good. You know the class of wells that are classified by the Railroad Commission as marginal wells in East Texas, don't you?

A. Yes, sir.

Q. Those are the wells that will not pump over 20 barrels a day.

A. Yes, sir.

Q. All right. They are not as good as my wells, are they?

A. No, sir.

Q. Now, since the Commission restricts me in the production of my wells to 17 days a month and permits those

marginal wells to operate 30 days a month, what is the effect?

A. The effect of it is that on a per well basis you wouldn't get as much oil as a marginal well which is capable of producing, say, 9 barrels a day.

Q. All right. They would take my oil, too, wouldn't they?

A. No, sir, I don't believe they would.

Q. Well, if I am shut down and the well is producing—permitted to produce and I am restricted, wouldn't they get [fol. 208] my oil?

A. Mr. Fischer, I can't quite understand what you mean by this term "my oil".

Q. Well, oil under my lease. You are talking about oil under the Humble's leases. Wouldn't they get some of the oil?

A. Which wells, the marginal wells?

Q. Yes, if they are permitted to remain open and pump and the 23 wells are restricted in their production, wouldn't the poor lease eventually take the oil away from the better lease?

A. There might be a small amount of oil that was taken under that sort of circumstances, but it would be less than one per cent of the production of the field.

Q. All right. Well, if it continued indefinitely—if the better lease were shut down and the poor ones permitted to pump, wouldn't the poor ones eventually get all of the oil of the better ones?

A. Yes, sir.

Q. All right. Now, you were talking about how much damage you are going to sustain if you don't get this order set up and get allowed 14.3 per cent of the pro-ration of the field. As I understood you yesterday, you said you would lose between forty-five and ninety million barrels eventually. Is that right?

A. Yes, sir.

Q. There is a variable there of 100 per cent in your estimation, isn't there, forty-five to ninety million barrels?

A. I can't make those figures exactly; that is the reason I put the spread in there.

[fol. 209] Q. Well, that is your estimate, isn't it?

A. Yes, sir.

Q. Yes, sir. Now, if your engineer, in estimating that, you have got 14.3 per cent of the acre-feet of sand in the

pool, and consequently 14.3 per cent of all the oil in the pool, if your engineer might slip like you are slipping here, and have the variable of 100 per cent, in his estimation, you might only have 7 per cent of the pool instead of 14.3 per cent, mightn't you?

A. The estimates that you are talking about are not subject to this 100 per cent area.

Q. You can't estimate what you are going to lose with the same degree of accuracy as you can what is 3600 feet under the ground down there, can you?

A. Because, Mr. Fischer, it is a much easier thing to estimate of reserves as of today in comparison with the reserves of the field as of today than to project into the future for 20 or 30 years under the operation of some particular order, and that is the reason you can make the estimate of our percentage of reserves far more accurately than you can make the estimate of what our estimate recovery would be under the hypothetical set of conditions projected into the future.

Q. Yes, sir. Well, any way you and Mr. Sorenson both admit that there is at least a ten per cent chance of mistake in your estimation of what acre-feet you have got and what oil you have got, don't you?

A. I believe that we said that in making up any one of those isopach maps that there might be as much as ten per cent error. Now, this is one — the total number of acre-feet. Now, then, relatively, comparing the ratio of one property with another or one property with the entire field, [fol. 210] that error is no longer as great as ten per cent, but is susceptible to a more accurate estimation than the number of acre-feet in the entire field.

Q. Well, you had an error of ten per cent in the entire field?

A. Yes, sir.

Q. Then if you ought to compare your Humble's acres with the entire field and you would have a ten per cent error there, wouldn't you?

A. No, sir.

Q. You wouldn't?

A. The reason is this, that the yardstick by which you measure the acre-feet in the entire field might be a little long or a little short, but you measure the reserve of a particular well you are interested in there with the same

yardstick, and for that reason on a percentage basis you can get the relative reserves far more accurately than you could estimate the absolute reserves.

Q. All right. If there is a variable of ten per cent in your estimation, and there is five billion barrels of oil in the pool, there is five million barrels of oil you are going to take off of one man and give it to another by that mistake, aren't you?

A. No, sir, you wouldn't take it off of that man.

Q. Well, there was a mistake of ten per cent, and ten per cent of five billion barrels is five million barrels, isn't it?

A. Yes, sir.

[fol. 211] Q. Well, if it was taken off of me and given to the Humble I would lose that, wouldn't I, by that mistake?

A. Mr. Fischer, no physical measurements can be made with absolute accuracy.

Q. Yes.

A. And I believe that—I believe that it would be impossible for the Railroad Commission ever to write an order which would give down to the exact last barrel the right to produce the reserves underlying a tract.

Q. Yes.

A. But they can come within very close to it, and the order now is far outside the range of engineering approximations that we have to make.

Q. All right. Now, Mr. Moore, the effect of this order is, and what you are contending for is the partition—is the partition of the oil you have in place in the pool, isn't it?

A. Yes, sir.

Q. That is what you want, a partition of it?

A. Well, any order is that.

Q. Yes, sir. All right. You want the Commission to say that the Humble has got 14.3 per cent of the oil in place in this pool—that is, what you want them to say, don't you?

A. Well, I don't want them to say anything, Mr. Fischer. I am only trying to explain what will happen if they do say certain things.

Q. Well, I am asking you if you are complaining because they haven't said that?

A. I am not complaining, no, sir; I am trying to explain what will happen under these various orders.

[fol. 212] Q. Well, that is the effect of the order any way, is a partition of the oil in that pool, isn't it, among the various owners?

A. The effect of any order is that, yes, sir.

Q. All-right. Now, you heard Mr. Sorenson's testimony yesterday, didn't you?

A. Yes, sir.

Q. He said that the Humble owned 6900 acres of land——

Judge Sibley: I think we had better leave him out now, and let this witness say what he thinks and knows.

Mr. Fischer: All right.

Q. Well, you know that the Humble has got 6900 acres of land that lies east of the water line, don't you?

A. I believe that is right; I think that is the figure.

Q. All right, and that 53 million barrels of oil has been produced from it?

A. Yes, sir.

Q. You still have in place the same amount of oil you started with nine years ago. All right. Now, if the oil is partitioned off by the Commission to the various owners and that 6500 acres with its underlying oil is partitioned to the Humble but it is never depleted, as fast as you can produce from it, why, it is replaced from the west side by somebody else's oil,—what happens to your parcel there that has been partitioned off to you?

A. Well, we don't get as much oil as others get that are similarly located on the structure in that part of the field.

Q. How come you don't?

[fol. 213] A. Because of the drive of the water.

Q. Well, and because you haven't drilled as many wells as the other folks, too?

A. Yes, sir.

Q. If you drilled as many wells as I did, you would get the same proportion as I did per acre-feet, wouldn't you?

A. I believe, Mr. Fischer, if we drilled as many wells as you did we would have an allowable of about a million barrels a day.

Q. I didn't ask you that. I asked you if you wouldn't get the same proportion that I get if you drilled the same number of wells that I did.

A. Yes, sir; our allowable would be about a million barrels a day.

Q. Yes, sir. Will you answer the question whether or not it would be in the same proportion?

A. I don't believe the field could produce that at the rate required.

Q. If you don't want to answer that, all right. It costs $10,000 today to drill a well, doesn't it?

A. Approximately, yes, sir.

Q. Now, what you want and what you are contending is that the formula be applied to each well without any base minimum, aren't you?

A. No, sir, I don't believe that is——.

Q. Well, you say that would be fair, don't you, that the Commission ought not to start off with a base minimum of 20 barrels——

A. Yes, sir.

[fol. 214] Q. But it ought to start with the application of the formula right in the ground?

A. I haven't made any recommendations of that kind, Mr. Fischer.

Q. Well, I understood that that was your contention here. Do you think that would be fair?

A. I don't believe that is our contention.

Q. It is not. Well, suppose then it was applied that way.

A. Yes, sir.

Q. There is thousands of wells in the field that were drilled on very small tracts because the people owned very small tracts, wasn't there?

A. Yes, sir.

Q. And they were drilled in pursuance of the orders of the Supreme Court of this State, weren't they?

A. I don't know about that.

Q. That each man had a right to drill one well upon his tract of land?

A. I am not familiar with those orders.

Q. All right. Let's see if you are familiar with this then. You know by the application of this principle to a tract of land 40 feet by 40 feet, he wouldn't get two barrels a day, would he?

A. He would get something like that, yes, sir.

Q. Yes, even where the sand is 90 feet deep, he would get about two barrels a day, wouldn't he?

A. I haven't figured it out exactly; that sounds approximately right.

Q. Yes. Now, then, if this order—if that had been the order of the Commission and that is the way it is applied [fol. 215] now, the man or the woman with a tract of land 40 feet by 40 feet couldn't possibly drill a well on it, could they?

A. I don't believe he would drill a well for two barrels a day, sir.

Q. Why, of course, he wouldn't; you know he wouldn't, Mr. Moore, so that man's property under his land would go to somebody else that had a large tract where he could drill and get a larger allowable, wouldn't it?

A. That situation has been handled otherwise in other fields, Mr. Fischer, so that the small tracts of this kind have been permitted to participate in the production.

Q. Yes, I know, but we are not talking about that now. We are talking about a situation that we have down in East Texas; that is what the Court is going to determine, and it wants your information about it—if that won't be true.

A. What wouldn't be true?

Q. If the well couldn't be drilled on the small tract, the oil under it would go to some other owner, wouldn't it—somebody else?

A. Not necessarily.

Q. Wouldn't it?

A. No, sir.

Q. Well, then, would that oil be lost and never be produced?

A. No, sir.

Q. Well, then, what would become of it if it wasn't lost and if it didn't go to anybody else—what would it do—just stay there?

A. Of course, I don't know what would happen, Mr. Fischer, but if he said that same thing has been—that same [fol. 216] situation has arisen in other fields——

Q. Yes, you are talking about pooling areas——

A. —and small tracts have arranged to participate in the production of the field and get their share of the reserves.

Q. Yes, but we don't have that situation in the East Texas Field. The wells were drilled without pooling arrangements. They were drilled on the proposition that each man was entitled to drill on his land?

A. It has not been necessary in the East Texas because those small tracts of 40 by 40 feet have been permitted under the Commission's order to recover just as much oil as the tracts of five acres or so.

Q. All right.

A. So a drilled pool would have been a great disadvantage to those tracts.

Q. Now, will you get back and answer my question if you please. If you don't want to answer it, say so and I won't ask it any more. I say that if a small tract of land wasn't going to be—coming in that allowable so a well could be drilled on it, what would become of the oil under that tract—would it be wasted or go to the owner of the adjacent tract?

A. I believe it would go to a joint ownership.

Q. Go to a what?

A. To some sort of a joint ownership. I don't believe any of those conditions you mentioned would obtain.

Q. All right. Now, suppose the Legislature was right about this proposition and it sat down and found that a pumping well could not exist on less than 20 barrels a day if it was pumping below 3,000 feet, and that well is cut down to 2 barrels, as well as all these others that don't have [fol. 217] a potential of enough—acreage enough to give them 20 barrels, and it is cut down to 2 barrels, what will become now of the oil in place under those tracts?

A. I don't believe there is very much oil in place under a well which would only obtain an allowable of 2 barrels per day.

Q. Well, I didn't ask you how much was under it. I asked you what would become of it whether it is little or big, what would become of that oil in place if the well must be shut down because its allowable is only 2 barrels or insufficient to operate on.

A. Well, I don't know about those 2 barrels; it would be pretty close to the border line.

Q. Well, whatever it is if it is insufficient to operate that and it must be closed down, will you tell me what will become of that oil that is under the ground?

A. It would be recovered by other wells in the field.

Q. I see. It would be recovered by other folks.

A. Yes, sir.

Mr. Fischer: That is all, sir.

Cross-examination.

Questions by Mr. Moody:

Q. I would like to ask you a few questions, Mr. Moore. Are you acquainted with the location in the field of the Rowan-Nichols-Todd A lease?

A. Yes, sir.

Q. Have you made any calculations to determine what amount of oil of that in place under the lease at this time [fol. 218] would be lost or that Rowan-Nichols wouldn't be able to produce during the life of the field, if the present plan of pro-ration is continued for the productive life of the field?

A. Well, Mr. Moody, I made a set of those calculations, but I didn't check the basic data on which they were made. That data was given verbally by Mr. Buck and I didn't verify it; but I made the calculations on the basis of this data that Mr. Buck furnished me.

Q. Can you state the acre-feet of sand that he gave you in that data?

Mr. Hart: If the Court please——

A, The thickness was 90 feet.

Mr. Hart: We object to this line of interrogation. Mr. Buck is present and anybody can make the mathematical calculation I suppose. I don't see the advantage of proving what the mathematical calculations were on a certain assumption.

Mr. Moody: I don't know, Your Honor, that anybody can make the calculations.

Judge Sibley: Well, Mr. Buck will be here and can be asked as a witness.

Mr. Moody: Yes, sir, Mr. Buck is here and we will undertake to get that from him.

Judge Sibley: All right, if you are going to undertake to prove the basic facts you can prove the mathematical result all right.

Mr. Moody: All right.

Q. What did your calculations show?

A. It showed somewhere between 800 and 900 thousand barrels would be drained from beneath that tract.

[fol. 219] Q. Well, you mean by that, if this order is continued in force during the productive life of the field?

Mr. Hart: If the Court please, we object to that question, because he hasn't stated what data he based that calculation on.

Judge Sibley: We can't tell whether Mr. Buck backs him or not.

Mr. Moody: Yes, sir, all right.

Q. What are the facts that you used in calculating this, Mr. Moore?

A. I used the allowable of the lease which was given me by Mr. Buck, and figured the 90 feet of sand which Mr. Buck gave me, the surface acreage, the number of wells in the lease—I have forgotten just exactly what those figures were now. I do remember the sand thickness, and those factors are then based upon some calculations I had based upon the effect of this order on the entire field. And I made the estimate of the ultimate recovery that would be obtained from those Rowan and Nichols leases.

Q. All right; in other words we are——

Mr. Hart: If the Court please, now, I wish to object to it because his statements are so indefinite we have no way to check the matter.

Judge Sibley: I think so too; I think the witness will have to get closer figures before he can undertake to give us his results. Perhaps Mr. Buck can give him his figures over again.

Mr. Moody: Very well, Your Honor.

Q. Mr. Moore, if the East Texas Field were allowed to [fol. 220] produce on open flow—that is, without any character of proration, what area of the field, if any, would have an advantage in production and produce the greater amount of oil?

A. In my opinion the center part of the field—that is, the Fairway, would.

Q. The Fairway?

A. Yes, sir.

Q. That is where the sand is the thickest?

A. Yes, sir.

Q. As this present order is enforced and applied in the field, if I understand correctly, the eastern and western edges of the field are allowed to produce more oil in proportion to the oil in place under those parts of the field, then is the gas with the center of the field?

A. Currently, yes, sir.

Q. All right. Well, this order just reserves what would be the situation, then, if the field were allowed to flow open without restriction, doesn't it?

A. Substantially, yes, sir.

Q. Now, during the life of the field, according to your calculations will there be any part of the field that will lose—assuming that this order is continued in force during

the productive life of the field, is there any particular area of the field that would, in your opinion, produce substantially less oil than the amount of oil in place now in that part of the field?

A. Yes, sir, I don't believe the Fairway under the present order will produce anything like the amount of oil in place.

[fol. 221] Q. All right, what about the east side of the field?

A. The east side, I believe, will produce considerably more than its oil in place.

Q. All right. Now, with respect to the present order as it is enforced and applied in the field, are operators in the field allowed to produce in proportion to the amount of oil that have in place under their tracks?

A. No, sir.

Q. Does that order as it is now enforced and applied give recognition to the advantage that one man may have on the structure, as compared with another man—are those matters held equal, or somebody on the structure may have a better position than someone else?

A. There is a very slight advantage to the better leases on the structure under the present order; they have some advantage, but not in proportion to the structural advantage.

Mr. Hart: If the Court please, we wish to object to that because I don't know from the statement what he means by advantage or what he means by better leases.

Judge Sibley: He is talking about potentials and all that.

Mr. Hart: That is what I don't know. I can't tell if he means——

Judge Sibley: There is no use of his telling us because we all know it already from what has been told.

Mr. Hart: Well, my objection is that it is indefinite and I don't know what he is talking about.

Judge Sibley: Well, I know what he is talking about.

[fol. 222] Mr. Hart: We except.

Q. Mr. Moore, with respect to the method of drilling wells—additional wells, in your opinion, what area will one well in the East Texas Field effectively drain?

A. I think that 6,000 wells would have been sufficient to have recovered efficiently all of the oil in the field.

Q. 6,000 wells; that would be about a well to——

A. That would average out a well to 20 acres, approximately.

Q. All right. Take the Rowan-Nichols lease—assuming that the Todd A lease—assuming there is 28 and a fraction acres in the lease and it has 7 wells on it and it is drilled to a density of one well to 4.3 acres—in your opinion, is that a sufficient number of wells to produce all of the recoverable oil for that tract of land if under the order of the Railroad Commission the tracts were allowed to produce along with other properties in the manner provided by the Statute, that it shall be—the allocation of the allowable shall be fair as between wells and leases? Do you get that?

A. If that fair as between leases means in proportion to reserves, why they have there a sufficient number of wells on their property if they were given an allowable in proportion to their reserves.

Q. Well, to make that a little clearer, you have—if you have 7 wells on that tract of land and the field produced open flow, would you think that 7 wells ought to be enough to produce all of the recoverable oil originally in place under the Rowan-Nichols property?

A. If the field were produced by open flow, I don't believe that that lease or this field would obtain as much oil [fol. 223] as it is going to produce, regardless of the number of wells in it.

Q. Well, I am not driving at whether it would get as much or more or less oil. I am talking about taking the field as it is right now and suppose that field were producing open flow, do you think that 7 wells on that lease would be capable of recovering all the oil?

A. I don't believe any number of wells would be capable of producing all the oil under open flow. You could drill 700 wells and still not get it under open flow because your operation of the field would be inefficient.

Q. In other words, you mean by that under open flow you wouldn't get as much oil as you would get under regulated operation of the field, is that what you mean?

A. Yes, sir.

Q. All right. Well, if the Railroad Commission's order—I will ask my question a little differently. If the Railroad Commission's order allowed Rowan & Nichols, along with others, to produce in equal proportions or as to the amount of oil they had, is it your opinion that 7 wells on the 28 acres would be sufficient to produce the recoverable oil under the 28 acre tract?

A. Yes, sir.

Q. I believe you say it costs about $10,000 to drill a well?

A. Yes, sir.

Q. Now, with respect to this matter of drilling wells on tracts, 40 feet by 40 feet that Mr. Fischer asked you about——

A. Yes, sir.

[fol. 224] Q. Do you know of any areas in that field at this time that have been of that type—that have not been drilled up, are you acquainted with any place——

A. Yes, sir, I know several areas in the field where they have drilled on tracts approximately that size.

Q. Well, I am not talking about that have been drilled. I am talking about that have not been drilled.

A. Oh, no, sir, I don't.

Q. As far as you know this field is all drilled up?

A. Yes, sir.

Q. Now, then you said that under this order that on the east side of the field there would be leases over there that would get substantially more than the amount of recoverable oil in place, originally in place, under those leases. Is that what you stated a while ago?

A. Yes, sir.

Q. Well, starting from now, the amount that is now under the leases *under the leases* there on the east, if this order *if* continued enforced from now during the balance of the productive life of the field, is it your opinion that the leases on the east will secure substantially more than the amount of recoverable oil now in place under those leases?

A. Yes, sir.

Q. Where is that oil going to come from?

A. It is going to come from the Fairway and the west side.

Q. Well, will leases like the Rowan & Nichols lease, which is in the Fairway—you so understand it to be, do you not?

A. Yes, sir.

Q. Well, leases like the Rowan & Nichols lease contribute [fol. 225] to this larger recovery of these east side leases, and by larger recovery I mean a recovery over and above the oil they have in place beneath them?

A. Yes, sir.

Q. Now, from your studies of this field what is your opinion with respect to whether or not this particular order

that the Railroad Commission is now enforcing in that field is necessary to prevent waste of oil and gas in the field?

A. With respect to the top allowable, I believe it is; with respect to the rest of the order, I don't believe it is.

Q. Well, I have reference not to the top allowable because I understand there isn't any particular attack being made here on the top allowable, but I am talking about the method of allocating between wells in the field—the field allowable, is that particular method necessary in order to prevent waste?

A. It is.

Q. Now, with respect to this business of a minimum allowable of 20 barrels per well throughout the field, do you think that it is necessary to enforce that 20 barrel minimum allowable in order to prevent waste?

A. No, sir.

Q. In your opinion, is it necessary to give every well in the East Texas Field that will make it a minimum of 20 barrels allowable in order to keep that well producing oil and from the standpoint of waste or from the standpoint of the economics of the thing of the one well?

A. No, sir, it is not.

Q. Can a well be produced in that field on five barrels production per day?

[fol. 226] A. I believe it can, yes, sir.

Q. Now, Mr. Moore, let me ask you this question; is it or not true that as long as you have a flat per well allowable of as much as 20 barrels per well clear over the field taking up 70 or 75 per cent of the daily field allowable, that the enforcement of that order in the field, in view of the way it has been drilled, the tremendous number of small tracts that have wells on them, will such an order and its application to that field result in unequaled takings from the properties and by unequaled takings from the properties I mean out of proportion to the reserves under them th-oughout the life of the field, and result in taking from one man to give to another.

A. Yes, sir, I believe it will.

Q. In so far as the order is a flat 20 barrels per well order, and that is leaving off the complement that is added to the 20 barrel, so far as the order is enforced and applied as a flat 20 barrel per well order, does it have the

effect to leave the poorest properties in the field to the level of the best, and you reduce the best properties in the field to the level of the worst?

Mr. Hart: We object to that, if the Court please, as being argumentative.

A. It has——

Judge Sibley: Well, it is argumentative and also self-evident.

Mr. Moody: All right, sir.

Q. Now, the next question I want to ask is does the amount that is added to the 20 barrel by the application of [fol. 227] the formula take away or from these properties back some of the disadvantage that one suffers and the advantage that the other suffers (enjoys) through the 20 barrel minimum. Does the application of the formula—does that then bring those properties back, or any of them, that you know of, to a position where they are producing ratably and in proportion to what they have, one with the other?

A. Well, you might find a few rare examples of specific properties that were brought back that way, but in general it would not.

Mr. Moody: All right, that is all.

Cross-examination.

Questions by Mr. Hart:

Q. Now, Mr. Moore, Governor Moody just asked you whether or not a well in the East Texas Field could be produced on a five barrels a day. Now, what kind of a well were you assuming there?

A. I was assuming the average pumping well in the field.

Judge Sibley: Before you proceed with the cross-examination, we will take a recess for five minutes.

(Thereupon Court was recessed at 10:30 A. M. until 10:45 A. M., at which time the following proceedings were had.)

[fol. 228] T. V. Moore, having resumed the stand, testified further as follows:

Cross-examination.

Questions by Mr. Hart:

Q. Mr. Moore, I believe you said that your figure of five barrels applied to an average pumping well in the field; is that correct?

A. Yes, sir. Mr. Hart, I would like to explain that I am not responsible for production costs and don't work with it. That figure was based upon the fact that there are a number of pumping wells in the field that are producing five barrels a day, and if you want more details, and the exact figures on that well cost, and cost of operation of wells, I would prefer you would get it from somebody that can speak with more authority than I can.

Q. You have an expert who will probably testify that, an expert on the cost of production and so on?

A. Mr. Baker can probably tell you. I think we have.

Q. All right, sir. I won't go into that. I want to ask you this. Are there pumping wells on the east side, as well as on the west side?

A. I believe so. Yes, sir.

Q. And the cost of operating a well on the east side is considerably less than the cost of operating a pumping well on the west side, where a large percentage of water is being produced?

A. I believe that is right.

Q. In fact, aren't you familiar with the fact, Mr. Moore, that the Humble Oil & Refining Company itself has aban-

[fol. 229] doned wells on the west side when they were producing, say as much as seven or eight barrels a day on the west side?

A. I am not familiar with those figures exactly, at what point they were abandoned.

Q. You don't recall that the Humble Oil & Refining Company Laird well was abandoned in August, 1939, when it had a production of 7.74 barrels a day?

A. No, I don't recall those figures.

Q. You don't know about that. All right, in answer to Governor Moody's question, I believe you stated, Mr. Moore, that an open flow production of the field would be an inefficient method of producing the field?

A. Yes, sir, that is my opinion.

Q. And that under a method of proration whereby the company allowable is cut down to approximately the present figure, there would be a greater ultimate production of oil from the field than there would be under open flow operation; isn't that correct?

A. Yes, sir.

Q. Could you give us an idea of approximately what percentage more will be produced from the field as a whole under this method of operation, as contrasted with an open flow method of operation?

A. I believe that under proper control of the field that you will recover 25 to 50% more oil than you would otherwise.

Q. All right, sir. Well, isn't it a fact, Mr. Moore, that not in speaking of the percentage, but of the absolute amount of oil produced, that under the present method of proration, the fairway will produce a larger amount of oil than you would under open flow conditions?

[fol. 230] A. That is possible.

Q. It is really probable, in your estimation. If you say the whole field will produce about 50% more, it is probable the fairway will produce more under the present method than it would under the open flow condition.

A. No, I wouldn't say it is probable. My opinion is that throughout the field under open flow, with the possible exceptions on the extreme east and west sides, but on the average, I believe you would get about half the oil in place from each property under open flow conditions, and I think that is about what the fairway is going to get now, approximately.

Q. I believe you said a while ago that you though possibly the fairway might produce more under this order than it would under open flow conditions?

A. It is probable——

Judge Sibley: Just for my information, what will become of that other 25 or 50% under open flow?

A. Your Honor, it would be less unrecoverable in the sands.

Judge Sibley: There is no pressure to force it to the well.

A. There is no pressure to force it to the well.

Q. (By Mr. Hart) Now, Mr. Moore, in these examples that you gave, you had examples of where the Humble Oil

& Refining Company was comparatively less densely drilled than these other leases you spoke of. The Humble Oil & Refining Company has leases in the field that are more densely drilled than the average of the field?

A. Yes.

[fol. 231] Q. In fact, it has some leases like the Neal Turner lease, drilled down to 1 well to 1 acre, approximately that.

A. I think there are probably examples where we have very dense drilling.

Q. And in the cases where the Humble has dense drilling it would have the same advantage on their leases that are densely drilled as these other examples you picked out owned by other people?

A. Yes, sir. There are quite a number of our leases where we have an advantage.

Q. And the only way of determining whether or not you are going to be hurt or benefitted on the whole is by taking an average, isn't that true, looking at the whole picture, and not just those specific examples?

A. You can do it either way, Mr. Hart, looking at it as a whole picture, or taking it as specific examples, and it comes out the same.

Q. There are examples, are there not, where the Humble is benefited over other leases that you can pick in the field?

A. Yes, sir.

Q. The Humble is drilled, I believe you say, to one well, an average of one well to 5.8 acres. Is that correct?

A. Yes, sir.

Q. You gave some figures here about the density of drilling on the Humble tracts east of the water level, I believe you stated. Is that east of the limits of water encroachment?

A. It is east of the present area of the field which is underlain by water. In other words, on that exhibit there showing the water encroachment it is east of that line drawn through the approximate center showing the limits of the [fol. 232] field now underlain by water.

Q. Do you know what the Humble's average density is west of that line?

A. I have those figures available. It is considerably—our properties to the west of there are considerably more densely drilled than they are to the east of there.

Q. Considerably more densely drilled?

A. Yes, sir, not more than the average, but more densely drilled than our east edge properties.

Q. Do you have that exact figure?

A. I am sure I can get it very conveniently. May I look at my notes?

Q. Certainly, and I would like to also get, if you have it, the average densities of the others west of the water line.

A. The average density on Humble properties west of the water line is 5.41 acres to the well, as compared to 5.27 for the others.

Q. I believe that you stated if Humble drilled down to a density of the average of the field, assuming the others didn't drill any more wells, the Humble under the present order would get substantially the equivalent of what you estimate to be its reserves; is that correct?

A. Let me say what I meant by the average density. It is the average density in proportion to our reserves, which would mean that our fairway leases would be drilled on a much greater density per acre than the average for the field, but the average density per acre-foot would have to be the same for the others in the field.

Q. Do you mean that under the operation of the present [fol. 233] order it would be necessary to drill the leases in the center of the field to a greater density than the leases on the edges of the field in order that they might recover their oil, recoverable oil in place, over the productive life of the field? I am not speaking currently, but over the productive life of the field.

A. Yes, sir, that east edge would still have some advantage.

Q. All right, sir. By the way, you spoke a while ago of structural advantage. Which part of the field has the structural advantage? What do you mean by that?

A. When I used those figures, I used the term structural advantage to mean the thickest part of the sand. Which part of the field actually has an advantage over another part depends on the order that you operate under, but I used it to mean the thickest part of the sand.

Q. All right, sir. And when you spoke of leases having structural advantage in answer to Governor Moody's questions, you meant the leases having the thickest sands, not

necessarily the leases on the east that will produce longer than the leases on the west?

A. I don't recall exactly that question. I believe that is the sense I used it in.

Q. The leases on the east side of the field have a natural structural advantage by reason of the fact they will produce longer than the leases in the middle or on the west side, don't they?

A. That is correct.

Q. That is an advantage that would exist, would it not, under any practical method of proration which would permit all of the field to produce?

[fol. 234] A. I believe that is correct, yes, sir.

Q. There is no practical method of proration that the Commission would adopt that would completely eliminate that advantage that the east side naturally has, isn't that correct?

A. I don't believe they could adopt it.

Q. Mr. Moore, you made certain calculations up there about what the Humble Oil & Refining Co. had produced, and what it would have produced had it been allowed to produce 14.3% of the oil produced to date.

A. Yes, sir.

Q. That is substantially what that chart over there—you, do you remember the number of that exhibit? I believe it is Plaintiff's Exhibit No. 9. That is substantially what that chart shows, isn't it, the difference between the amount of oil you have produced, and the amount of oil you would have produced if you had been allowed to produce 14.3% of the oil produced from the whole field to date?

A. Yes, sir.

Q. You don't mean to say, do you, Mr. Moore, that the figure of sixty-four million barrels represents the difference between the amount of oil that the Humble Oil & Refining Company has produced, and the extent of the depletion of those leases to date, the actual physical depletion of those leases?

A. I don't know that I understand your question. Do you mean that that sixty-four million barrels is the difference between the amount of oil which we have actually recovered and the extent to which our leases have been drained? That is, somebody has produced a total of sixty-four million [fol. 235] barrels, plus 130,000,000, or about 200,000,000 bar-

rels from underneath our leases, and our leases have been depleted approximately to that extent.

Q. I don't intend to mean anything, Mr. Moore. I am just asking you a question there. What has been the production from your leases to date? Let's get at it this way.

A. Approximately 130,000,000 barrels.

Q. What has been the depletion in acre-feet of your leases up to the present time?

A. I haven't got that figure in acre-feet.

Q. Didn't you give a figure in acre-feet yesterday of 119,770 acre-feet of depletion on the Humble leases up to the present time?

A. Let me see what that figure was. See if I have got a note on that—yes, sir, that is—no, wait a minute. That wasn't the depletion of our leases.

Q. What was that?

A. That was the approximate number of acre-feet, assuming a recovery of 1,100 barrels per acre foot, equivalent to the amount of oil that we had produced.

Q. Do you have any figure there, or do you have any estimate, can you give me any estimate of the actual number of acre-feet of sand that hav' been depleted under the Humble leases to date?

Judge Sibley: Do you mean, invaded by water?

Mr. Hart: Yes, sir.

A. I can give that to you approximately, Mr. Hart. I believe yesterday I quoted the figure of some 124,000,000 barrels—124,000,000 acre-feet at 1,100 barrels per acre foot, which would have been flooded out to account for the past production——

[fol. 236] Q. Just a minute, please, sir. How did you get that 124,000,000 acre-feet? You just took your estimate of the amount of oil that had been produced to date, and assumed that 1,100 barrels per acre foot was produced, and divided it into that? Was that all?

A. Yes, sir, that is correct.

Q. If there hasn't been actually 1,100 barrels per acre foot produced, that figure would be off to the extent of the variation between the figure of 1,100 barrels per acre foot and the actual production per acre foot to date; isn't that correct?

A. Yes, sir.

Q. Instead of just making a mathematical calculation on an assumption like that, let me ask you if the Humble has actually by investigations in the field of loss, and however else you might have determined it, has it actually tried to determine the actual number of acre-feet which have been depleted in the field up to date?

A. Yes, sir, I believe they have. However, I think that this is a more accurate method of doing it.

Q. Will you give me that figure?

A. I haven't got it.

Q. Don't you think it is important that we should know the actual number of acre-feet depleted in the field, and in the Humble leases so that we can know whether there has been any depletion to it, and if so, how much; what percentage of the acre-feet left the Humble Oil & Refining Company has.

[fol. 237] A. It may be important. I think that in determining the total number of acre-feet flooded, that this is the more accurate of the two methods of making that computation.

Q. That computation is simply, first of all, that you make, is simply, first of all, an estimate of the amount of oil produced, and an assumption of how much oil per acre foot has been produced, and you just divide them out. There is no attempt to check on the actual physical facts in the field, is there?

A. No, sir, that 1,100 barrels per acre foot is not an assumption. It is a very reliable estimate of—in my opinion, of what an acre foot of sand will yield under the conditions the East Texas Field is being operated under.

Mr. Baker: Mr. Hart, if you want those figures, they are here available, and I can turn them over to the witness.

Mr. Hart: Do you have a copy?

Mr. Baker: Yes, I can let you have a copy.

(Thereupon counsel handed said figures to counsel and the witness.)

By Mr. Hart:

Q. Now, Moore, you have changed your opinion have you not, about the recovery per acre foot in the East Texas Field since last August when the Commission had a hearing on the Humble application? Wasn't your opinion at that time that the recovery per acre foot in the East Texas

Field would probably be 1,000 barrels, instead of 1,100 barrels?

A. No, not past recovery. I believe, Mr. Hart, that figure of 1,000 barrels per acre foot that I quoted was an average [fol. 238] throughout the life of the field. I believe that the water drive has been more efficient in flooding the acre-feet, flooding the sand up to the present time, but throughout the life of the field it will not be so efficient, and so, that overall, the sand will not yield 1,100 barrels per acre foot, although it has done so up to the present time.

Q. Then your estimate of the recovery per acre foot up to the present time now is about 1,100 barrels per acre foot, is that correct?

A. Yes, sir.

Q. What is your estimate of what the recovery per acre foot will be in the future, from now on?

A. I think it will—I think it will probably average in the future somewhere between 900 and 1,000.

Q. And what, in your opinion, is the explanation of the difference between what you say has been recovered per acre foot in the past, and what will be recovered per acre foot in the future?

A. I believe that in the early life of the field, that the power of the water drive will be greater and it will wash the sands more effectively than it will after the water has had to move through some five miles or farther of sand that was once oil bearing.

Q. In your judgment, is there any difference in the amount of recoverable oil per acre foot in the west side of the field, say, from the east side of the field?

A. I think the total amount of oil in place in—let's don't take the extreme east, but in a little ways from the extreme east, and in a little ways from the extreme west, in order to [fol. 239] get away from this little margin where there is a little border line, whether it is an oil sand or not; the total amount of oil in place is about the same in both of those areas, but it will be possible to recover more oil from the extreme west edge leases than it will from the extreme east edge leases.

Q. Could you give us the difference between those two, approximately?

A. Yes, I think your east edge leases might not give as much as 900 barrels per acre foot, whereas, your west edge leases will give you approximately 1,100.

Q. That is from now on?

A. Yes, sir.

Q. Now, Mr. Moore, you were going to give us some figures there on the actual depletion of the Humble leases to date, and actual depletion of the field to date. What figures do you have there.

A. I have here some figures which show the number of acre feet from the entire field drained, are 910,720. Those others have been drained, have been depleted to the extent of 790,694. Humble has been drained to the extent of 120,026.

Q. All right, sir. Now, you take 1,100 barrels per acre foot that has been produced to date, and multiply that by the number of acre-feet that have been depleted from the Humble leases to date, and what would you get? How many barrels of recoverable oil per acre foot from that part of the Humble leases that have been depleted to date?

A. You would get approximately 120—130,000,000 barrels. However, I don't believe that is an accurate method of making that computation because——

[fol. 240] Q. Just a minute, please, sir. Let me ask you one thing at a time, and then you can go into an explanation. If you take what you say is an accurate expression, an accurate estimate, as well as you can reach it, of the amount of production of recoverable oil per acre foot so far, you would get approximately the same figure of the depletion from the Humble leases as the Humble has actually produced up to the present time, wouldn't you?

A. That is correct, but if you take this same set of figures and compare it to others, why, you find that in order for this same set of figures to match up by a similar calculation, you will find that other leases in the field have produced about 40% more per acre foot than Humble.

Q. All right, sir. But the Humble has just about produced what has been depleted from its leases, according to that calculation.

A. I don't think that calculation shows that, Mr. Hart.

Q. Well, the Humble has produced 131,000,000 barrels, hasn't it?

A. Yes, sir.

Q. And it has been depleted, according to that estimate—that is an estimate the Humble made, isn't it?

A. Yes, sir.

Q. It has been depleted 120,000 acre-feet, approximately?

A. Yes, sir.

Q. And your estimate of the recovery per acre foot is about 1,100 barrels?

A. Yes, sir.

[fol. 241] Q. Multiply that by 120, you get what Humble has produced to date?

A. Yes, sir.

Q. All right.

A. May I explain that?

Q. Go on, explain it.

A. These estimates of acre-foot figures, as I have said, are subject to some inherent errors.

Q. Is that true of any estimate of acre-feet?

A. Yes, sir.

Q. Well, then, you estimated all your acre-feet the same way, didn't you?

A. Yes, sir.

Q. Well, this estimate of 14.3 per cent you say you have left in the field would be subject to those same errors, wouldn't it?

A. Not the same errors. It is subject to errors which would be much smaller.

Q. You didn't calculate the figure on which you base your percentage of 14.3 per cent in the same way you calculated these figures?

A. Yes, sir.

Q. You did calculate them in the same way?

A. Yes, sir.

Q. All right.

A. Now, there probably was some oil obtained below the level which is generally accepted as the original table and from which both our map and the Commission's map were based on. Now, then, we are taking here these figures for the acre-feet of sand and we are subtracting two large quantities, each one of which might be subject to some [fol. 242] error. To give you an idea of the possible accuracy of these figures, why, let me quote here from this sheet the comparison between the Commission map and our original map which we made up entirely independently and from different data and by different people. The Commission map showed 4,961,546 acre-feet and our original map showed 4,976,020 acre-feet.

Q. Originally?

A. Yes, sir.

Q. Excuse me just a moment. In the August hearing before the Railroad Commission the Humble estimate was 5,208,000 acre-feet, wasn't it?

A. Yes, sir.

Q. And you say your present estimate is how much?

A. 4,974,000.

Q. How far off were you there on those two estimates you made?

A. Well, we were off three parts in fifty, or about six per cent.

Q. That is between your August hearing before the Railroad Commission, and when was that figure that you have there?

A. It was computed between that time and this, using more data that we had.

Q. I see. Then there has been a six per cent variation in that time. When you got to checking over you found you were six per cent off, is that correct?

A. Yes, sir.

Q. Now, are there any other inaccuracies in these?

A. Well, when we come to compare the total depletion in the field with the production from the field we find that it gives a very high barrels per acre-foot recovery, and that [fol. 243] high barrels per acre-foot recovery is a very difficult thing to explain. Apparently more oil came out of that field than should have come out of it, if these figures are exactly correct, and if there were no oil below the 3,320 foot contour. Now, my own opinion is that there was a substantial amount of oil below the 3,320 contour and that that is one of the causes as to why this acre-feet recovery computed on this basis, which I don't think it is the way to compute it, gives you such high figures.

Q. Well, now, you are saying, substantially, aren't you, that these estimates that the Humble has made of the acre-feet of sand depleted in the Humble Leases is essentially inaccurate?

A. No, sir, I didn't say that.

Q. Well, it is essentially accurate, then, as near as you can determine, is that correct?

A. I think that insofar as these figures are useful for determining our proportion of the reserves in the field, that they are essentially accurate, and the probability of error I think is indicated here, I think, by the comparison by which these two independent maps give essentially the same

answer. Now, I think the slight difference in those figures, the comparison between those figures, gives you the idea of the probability of error in determining our percentage of the reserves in the field.

Q. Now, have you made a complete explanation, then? I don't want to cut you off.

A. I think that is all I want to explain at this time.

Q. You said there was a certain amount of oil below the 3,320 level, is that correct?

A. Yes, sir.

[fol. 244] Q. Is it your position that the field is absolutely free communication, there is absolutely free communication there in the East Texas field?

A. Yes, sir.

Q. Was that water level substantially horizontal at the time the field was opened?

A. Yes, sir. I think what we commonly understand as the water level, that is the dividing line between the point at which a well makes pipeline oil and the point at which it makes some water, that that was substantially horizontal.

Q. I understood you to say there was a substantial amount of oil below the 3,320 foot water level?

A. Yes, sir.

Q. Just explain, if the field had reached an equilibrium over geological times and you got the water level accurate, how there could be oil below that if there was free communication in the reservoir?

A. It comes about because in the nature of things this water level isn't a sharp and exact thing. There is no sharp dividing line above which the sand is essentially saturated with oil and below which the sand is essentially saturated with water, but you have a zone there in which the sand grades from a sand which is almost all saturated with oil, let's say eighty-five per cent saturated with oil, and a little lower there is a little more water and less oil and a little lower there is still more water and still less oil, until finally several feet below there you reach a point where the sand has practically no oil and all water. And this water table must be considered as a zone and not as a sharp, exact dividing line.

[fol. 245] Q. Well, all that makes it pretty hard to determine exactly how many acre-feet of oil sand you have, exactly, in the field and under any particular lease, doesn't it?

A. Yes, sir. I don't believe you can determine exactly, with absolute precision, the number of acre-feet of sand you have in a field.

Q. Now, Mr. Moore, as I understood you with reference to the future production from the Humble leases, you first gave Mr. Baker a figure of 100,000,000 barrels, and that figure was the difference between what you estimate—the difference between 11.15 per cent of what you estimate to be the recoverable oil left in the field and 14.3 per cent of what you estimate to be the original oil left in the field, wasn't it?

A. Yes, sir.

Q. You did not mean to give the court the impression that if the present order is continued in effect from now on the Humble will actually produce 100,000,000 barrels less than the recoverable oil now in place underneath its leases, do you?

A. No, sir.

Q. You didn't mean to give that impression by that at all?

A. No, sir.

Q. Actually the Humble will produce, according to your estimate, somewhere between say 45,000,000 and 85,000,000 less than its recoverable reserves, according to your estimate, is that correct?

A. Yes, sir.

Q. Now, the discrepancy between the two, is it due to the fact that the Humble leases, in general, will produce longer than the average of the field, or by reason of the operation of the present order produce a little more than the average of the field, so that their production is not [fol. 246] directly proportional to the present current percentage of the current allowable?

A. Well, they will never produce more than the average of the field. If this order is projected throughout the life of the field, why, it means that under that order we will not always be getting this 11.17, or whatever it is we get now. Our percentage will vary as different parts of the field are flooded out.

Q. At certain times, then, during the producing life of the field, under this formula, the Humble will be getting a greater percentage than 11 per cent of the current allowable in the field, won't it?

A. I believe it will, yes, sir.

Q. This order will not work out so you will always get 11 per cent, but you will get more at times, so for that reason you estimate that your loss will be considerably less than the 100,000,000 barrels, which would be a straight application between 11 per cent and 14 per cent of the recoverable oil left in the field?

A. Yes, sir.

Q. That is due, isn't it, Mr. Moore, to the fact that the leases in the fairway and as you go eastward all are of a longer producing life than the leases on the west side of the field?

A. That is primarily what it is due to. It is due to essentially that factor.

Q. Well, in your opinion, will the west side of the field go out first, and then as you go eastward, say to the west side of the fairway, and then the center of the fairway and the east side of the fairway, and then the east side? Is that the way the field in going to be depleted?

[fol. 247] A. It will be approximately in that order. There might be some instances, for instance where the fairway would go out at the same time as the west side, and a few things like that. I can't say exactly, but essentially that is a correct picture.

Q. And there would be, would there not, a direct relation between the top of the sand and the producing life of the various sections of the field? In other words, if the top of the sand is high the water won't get to it until some time after it gets to sections which are lower down on the structure, is that correct?

A. I don't believe that is correct, Mr. Hart, because this water table—that would be true if the water table continued to rise as a level plane. It hasn't done that in the past. I don't believe it will in the future.

Q. How has that risen in the past, and how do you think it will rise in the future?

A. In the past it has risen to a greater extent under the fairway than it has under the west side.

Q. Why is that, Mr. Moore, in your judgment?

A. I think it is due to the structure of the field.

Q. To the what?

A. I think it is due to a combination of several things. The structure of the field. The fact that the water is probably more free to move horizontally than it is vertically,

or more free to move along the bedding planes in the sand than across.

Q. What do you mean by the bedding planes? You mean the shale breaks have any influence on the manner in which the water has encroached in the field?

[fol. 248] A. Yes, sir, I think the shale breaks hinder the movement of water across the shale breaks without essentially hindering the horizontal movement of the water.

Q. All right.

A. And finally it is due to the manner in which the oil has been distributed.

Q. Mr. Fischer asked you about these marginal wells, that is, wells that are incapable of pumping more than twenty barrels per day. Generally speaking, where are those marginal wells located, on the edges of the field, the fairway or where?

A. I believe in general they are on the edges of the field.

Q. They constitute a pretty negligible feature of the production in the East Texas field, don't they?

A. Yes, sir.

Q. As a matter of fact, there won't be any substantial amount of oil lost by any other operators as a result of the operation of these marginal wells, will there?

A. I believe there will be very little oil lost that way.

Q. As a matter of fact, as the field is depleted, as you go on across the field, every well in the field will probably sooner or later get down to where it is a marginal well, won't it?

A. I think you can expect that the amount of marginal wells will increase, but I doubt if it will amount to a tremendous per cent of the field.

Q. Well, as they do get down they will get the same benefit from this marginal allowable that the present wells do, won't they?

A. Yes, sir.

Q. Now, Mr. Moore, these examples that you gave there of leases about on the same position on the structure showed [fol. 249] certain leases that were densely drilled and certain leases that were not so densely drilled. Now, is it your opinion that, assuming the same position on the structure, that the densely drilled leases will produce just as long as the less densely drilled leases, or that they will go out sooner than the less densely drilled leases?

A. I believe they will produce approximately the same length of time. There are some examples where concentrated dense drilling in localized areas has brought about irregular encroachment of the water and has prematurely drowned out that portion of the sand.

Q. Do you think that would generally be true over the field, that the densely drilled portions would probably go out of production before the less densely drilled portions, even where they have the same position on structure?

A. To a limited extent that is true. I think that this dense concentration of wells and high withdrawals from a localized area probably makes wasteful production and irregular encroachment of the water there, so that they probably will not produce as long as the evenly drilled leases which are drilled to the average of the field.

Q. Well, by wasteful production you don't mean those densely drilled leases won't produce as much oil per acre or per hundred acre-feet of sand as the less densely drilled leases, do you?

A. Yes, I think under the densely drilled leases there will be more oil trapped in the sand, unrecoverable, than under the other leases.

Q. I asked you if they wouldn't produce more per foot of sand than the less densely drilled leases?

[fol. 250] A. Of course, they will, because they will be draining a far wider area than the area of the lease.

Q. But whatever the cause may be, in your judgment they probably will not last as long as the less densely drilled areas in the same position on the structure?

A. Yes, sir.

Q. Now, you spoke of the distribution of the allowable under the present order as contrasted with the old order. Now, under the old order there were about 19,000 wells that got exactly twenty barrels a day, isn't that true?

A. I think that is the approximate figure.

Q. Under the present order there aren't any wells in the field that get exactly twenty barrels per day allowable, are there?

A. No, sir.

Q. When you spoke of a flat twenty barrel allowable to a certain number of wells you didn't mean to convey to the court the impression that those wells got twenty barrels and no more and no less, did you?

A. No, sir.

Q. The exact allowable varies from a little over twenty barrels per well up to about fifty barrels per well, doesn't it?

A. Yes, sir.

Q. Generally speaking, the wells located on the leases on the edge of the field will get only a small number of barrels at most in excess of twenty barrels per day, isn't that true?

A. Yes, sir.

Q. And leases in the center of the field, assuming an average density, will get the big allowables, isn't that true, big allowables for wells?

A. Well, they will get about twice as much, possibly, as [fol. 251] those on the edge.

Q. Well, sometimes it will run more than two and a half times, won't it?

A. There probably are examples of that.

Q. Now, the increase in the total field allowable, then, by virtue of the new order went largely to the wells located on tracts which have thick sand and where the density is not as great as it is in other portions of the field, isn't that true, generally speaking?

A. Not exactly. When you take the number of shut down days into account, why, you find that some of the leases in the better part of the field were increased and some of the others were decreased.

Q. The ones that were decreased in the center of the field, taking a producing day, the amount on the days in which they are allowed to produce, the wells that were decreased are the wells that were very densely drilled, like Mr. Fischer's?

A. Yes, sir.

Q. The wells that were not so densely drilled got a substantial increase in allowable?

A. Yes, sir.

Q. The ones that didn't get much advantage in the new order were wells located on leases with thin sands or wells located on leases that were densely drilled, is that true?

A. Yes, sir.

Q. Now, Mr. Fischer asked you as an example about a tract located in the center of the field that had a small area and he asked you what the allowable would be if you eliminated this base or minimum allowable. I believe you said it would be about two barrels per day?

A. Yes, sir.

[fol. 252] Q. Suppose you take an average lease on the edge of the field, say on the west side, and five acres, one well to five acres, and say it has only from five up to ten feet of sand, and you eliminated this marginal allowable, would you know how much allowable a well on a tract like that would get per day?

A. On five acres?

Q. Say five acres and five feet of sand.

A. To make a rough calculation, it would get about a fourth of the average well, and, the average well on this schedule now gets about thirty barrels. It would probably get, roughly, seven or eight barrels per day.

Q. On a five acre tract?

A. Yes, sir.

Q. With five feet of sand?

A. I was figuring ten feet. I was guessing approximately ten feet. And they are just approximate figures, Mr. Hart.

Redirect examination.

Questions by Mr. Baker:

Q. Mr. Moore, Mr. Fischer was talking about a tract forty by forty feet. It wouldn't have much oil in place under it, would it?

A. No, sir.

Q. Don't you think if that well was produced any length of time at all it has probably produced already a good deal more than its reserves?

A. Yes, sir.

Q. Will you state whether or not a two barrel allowable to a well of that sort would enable it to recover more than [fol. 253] its reserves during the producing life of the field, in all probability?

A. If it were produced at that rate I believe it would.

Q. Do you know of anything that would prevent the pooling of small tracts, voluntary pooling of them?

A. It is done in other fields.

Mr. Hart: We object to that as being a legal conclusion. It is a question of law.

Judge Sibley: I suppose all we have to deal with is the reasonableness of what was done. The wells are already there.

Mr. Baker: Very well, Your Honor.

Q. Some suggestion was made here that one way for the Humble to remedy its situation was to drill more wells. If it were to drill down—if that remedy were pursued, state whether or not in your opinion the tendency would be always to have to drill down to the lowest density?

Mr. Hart: We object to that as being pure conjecture. It isn't an estimate made on any geological or engineering facts. It is just a speculation on what might happen if they drilled, and then somebody else drilled.

Judge Sibley: I suppose that is more of an argument than expert opinion.

Mr. Baker: Very well, Your Honor.

Q. How many wells would it take to drill the field down one well to an acre.

A. It would take about 75,000 or 80,000 more wells.

Mr. Hart: We object to that as being entirely immaterial. Nobody is advocating, that I know of, at this time that that [fol. 254] should be done. Certainly that is not an issue in this case.

Judge Sibley: I suppose the cost of it is the reason why it isn't done.

Mr. Hart: They are all in the oil business to make money, and if they can't make it, considering the costs necessary, they are not going to drill.

Judge Sibley: I will let the evidence stay in as to how many wells it would take to reach that density, but I don't know that we had better press the matter too much. The Commission has a veto on allowing all these wells, I understand.

Mr. Baker: I would like to make an inquiry as to whether Mr. Hart will admit the Humble Company shouldn't be required to drill any more wells. If so I will drop this line of questioning.

Mr. Hart: No, I won't make an admission like that. I don't know whether they should or not. It is not an issue in this case, as I see it.

Mr. Baker: You think that is not an issue in this case?

Mr. Hart: It may be that they ought to go on and drill more, I don't know. The Commission is not now trying to require them to. Maybe you haven't taken advantage of the rights you have by not trying to get some more wells and drill them, and by refusing to go ahead and make an

application. Maybe you haven't exhausted your administrative remedy.

Mr. Baker: We are taking the position that we have drilled more than enough wells to drill our property, and [fol. 255] that it would be throwing money away to drill any more.

Q. Assuming that this drilling were to go on indefinitely, say down to one well to one acre, with the present allowable what would be the per well allowable?

A. It would be—you mean assuming a 400,000 barrel top?

Q. Yes, sir, assuming the present top allowable.

A. It would be about three barrels per well on the average.

Q. Drag, all, on the average, down to that level?

A. Yes, sir.

Q. Now, you stated something about the percentage of recovery under open flow conditions. State whether or not you think that oil would be lost by trapping and development and coning?

A. I believe it would, yes, sir.

Q. Will you explain what you mean by that?

A. Well, these sands are widely varying in textures, and under a rapid rate of flow, why, the water is going to move faster through some sands than through others, and it will tend to move toward the concentrated point of localized withdrawals, and this will result in the oil contained in some portions of the sand being completely enveloped by water and remaining there substantially unrecoverable. About the only way to recover it would be to dig the sand out and wash it out. Now, under slow rates of production, under a proper rate of production, why, the various physical forces that operated on this water would tend to keep the table approximately smooth and their movement more or less uniform through all of the sands of all the varying textures, and it will wash the sands free of their recoverable oil.

Q. You spoke, I believe in answer to a question by Mr. Hart, you said something about the advantages that wells [fol. 256] enjoy on the east side. Do you or not think that that natural advantage is anything nearly compatible with the advantage that those leases enjoy under the existing order?

A. They enjoy far greater advantage under the existing order.

Q. That is by virtue of what factor?

A. By virtue of the application of the twenty barrel per well minimum to those leases.

Q. I believe you stated in answer to one question of Mr. Hart's that the wells in the center of the field produced in the order of from two to two and a half times what they do on the edges of the field?

A. Yes, sir.

Q. Will you state the order of magnitude of sand thickness and reserves in comparing these areas?

A. Well, it is about eight or ten times greater on the fairway than on the edges.

Q. Is that one reason why you say that under the existing order the fairway leases could never recover the equivalent of their oil in place?

A. Yes, sir.

Q. Now, I believe you stated in answer to one question here that you cannot determine with absolute accuracy the number of acre-feet in the field. I wish to ask you whether or not you can determine with approximate accuracy the relative percentage of acre-feet of sand between the various leases in the field?

A. Yes, I believe you can. That is indicated by the fact that these several—at least two independent measurements of that quantity have come within—well, they actually came within about a half of one per cent of an exact check.

[fol. 257] Recross-examination.

Questions by Mr. Moody:

Q. Mr. Moore, this drilling to the average density of the acre-feet of sand, that is, drilling leases to the average density of acre-feet of sand drilling in the field, that would be an impossibility, wouldn't it, for the reason that when a man drilled his lease down to the present average density for acre-feet or hundred acre-feet, why, automatically the density would change, and so on every time you drilled a well you would change your average density per hundred acre-feet of sand, isn't that true?

A. Yes, sir, you would have to drill down to the density of the most closely drilled lease in the field.

Q. So the result of it is, from a practical standpoint, is it not, that the field cannot be drilled so that each lease

is drilled to the average density of drilling per hundred acre-feet of sand in the leases?

A. I believe that would be impractical.

Q. It is not only impractical, it is not a possible thing to do, is it, Mr. Moore?

A. I suppose it is mechanically possible to put twenty wells on an acre.

Q. For 133,000 acres?

A. On some of them you would have to have more than that.

Q. You wouldn't have room for slush pits to do your drilling, would you?

A. I don't believe you would.

Q. Now, about this east side advantage you are talking about, you are talking about under open flow conditions, are you not? When you spoke of east side advantages?

[fol. 258] A. I don't think the east side has much advantage under open flow.

Q. Then that would not exist then?

A. No, sir.

Q. Now, then, does this order as it is now enforced and applied in the field give to the east side a greater advantage than it would have under open flow conditions?

A. Yes, sir, it does.

Q. Does it reduce the advantage that the other parts of the field would have under open flow conditions?

A. I don't believe it reduces the advantage to the west side much. It does to the fairway.

Recross-examination.

Questions by Mr. Fischer:

Q. Mr. Moore, if the Commission gave the Humble 14.3 per cent and Rowan & Nichols and these other folks what they are claiming that they have been deprived of, and kept the minimum of twenty barrels per well, it would raise the allowable quite a little in the field, wouldn't it?

A. You couldn't give them that and keep a twenty barrel minimum.

Q. I say if you gave them those figures it would raise the allowable, wouldn't it?

A. You couldn't do that. It is just impossible to do that.

Q. You couldn't?

A. No, sir.

Q. Well, how come you couldn't if you gave 14 per cent instead of 11 per cent, why wouldn't it raise the allowable for the field?

[fol. 259] A. Mr. Fischer, everybody's leases would add up to a hundred per cent of the field allowable and then you still would have to give them a twenty barrel minimum on top of that, and you just can't do it.

Q. All right. Your complaint is that you say the Commission says they have given you the full amount of your proportion and you say they haven't?

A. Yes, sir. I don't know what the complaint is.

Q. Now, you are one of these folks that believes that more than 450,000 barrels is wasteful producing of the field, aren't you?

A. Yes, sir, I believe that would be conducive to waste.

Q. Under the present order if we produce twenty barrels it would be 690,000 barrels?

A. Yes, sir.

Q. So we cut back to seventeen barrels and it makes about 450,000 barrels?

A. Somewhere around there.

Q. Now, if we are going to produce thirty days a month and keep it within your estimate of 450,000 barrels a day, why, then naturally the little wells have to be cut down, don't they? Is that the result?

A. Well, yes, sir.

Recross-examination.

Questions by Mr. Moody:

Q. Under your statement, returning for a second to that matter of drilling an average density per hundred acre-feet in the field, that is the only way that this order could be made to operate and give each man his oil under his [fol. 260] land as the other man got the oil under his land, isn't that correct?

A. Yes, sir.

Recross-examination.

Questions by Mr. Hart:

Q. Mr. Moore, do you mean that as applied to the current allowable or do you mean that as applied to the ultimate production in the field?

A. That would apply to the current allowable and would also apply to the relative ultimate production of similarly located—of leases similarly located on the structure.

Q. Now, leases similarly located on a structure have about the same sand thickness, don't they? They have about the same sand thickness as the lease next to them?

A. Approximately.

Q. Well, if you had two leases similarly located on the structure and you had them drilled to the same density, that is the same density per surface acreage, they would also be drilled to substantially the same density per acre-feet of sand, wouldn't they?

A. Yes, sir.

Q. Then all you would have to do——

A. That is if you had the same thickness.

Q. Then all you would have to do is drill them down to about the same average density per acre in the same structure?

A. No, sir. If you drill down to the same density per acre the fairway leases would still suffer a disadvantage.

Q. Even in spite of the fact that they will produce longer than the leases to the west of them?

A. Yes, sir. By that I mean—the east side edge, as I [fol. 261] have said, has a considerable advantage over the fairway and the west side, the way the order is now written. If you drill down to the same density per acre the east edge would still retain its great advantage. If you drill down to the same density per acre-foot the east edge may still have some advantage, but it wouldn't be as disproportionate as it now is, or if you drilled down to the same density per acre.

Q. Do you believe there is a certain area on the eastern edge where the sands are relatively impermeable and which probably will go out of production before the center of the field or the eastern portion of the fairway?

A. Yes, there is a small fringe along the east edge where I believe that will occur.

Q. About how wide is that fringe?

A. A location or so.

Q. What do you mean?

A. Maybe a location or two.

Q. What do you mean by that?

A. Just a few hundred feet. There is an area of that field over on the east edge where these oil bearing sands

sort of gradually fade into shale. There are a number of wells which have been completed in an area where it is just questionable whether there is much oil there or not, and it is only by virtue of the fact that the allowable of the field has been kept so low that those leases have been able to produce as much as they have. Now, in this area which is on the border line between sand and shale, and where the sand grades into the shale, there are some small wells that have been produced, and the chances are those wells will not be able to produce economically as long as the wells [fol. 262] that are completed in the clean sand in the east edge of the field.

Redirect examination.

Questions by Mr. Baker:

Q. Mr. Moore, I believe you testified awhile ago that you had made some computations to determine what the effect upon the plaintiff would be of this order in the event it was continued during the balance of the life of the field?

A. Yes, sir.

Q. I believe you said some of the plaintiff's leases on the east side would recover considerably more than their reserves?

A. Yes, sir.

Q. What was the result with respect to some leases in the fairway or all of the company's leases in the fairway and the west side?

A. Well, they will be drained to a very great extent, and some of our leases will be drained and some of them will drain others, but the leases of ours which are drained will lose far more oil than our leases which benefit will gain.

Q. Is that why you gave that figure from 45,000,000 to 90,000,000 barrels?

A. Yes, sir.

Q. What do you mean by that?

A. I mean that I think it is going to come out about 85,000,000 barrels, but there is a possibility of error in making the computations that I made in order to arrive at that figure. I didn't want to give the impression that it was a mathematically precise figure when there was some possibility of error, so in spite of the fact that my computations [fol. 263] said 85,000,000, I quoted a figure from 45,000,000 to 90,000,000 to allow for errors.

Q. You mean by that that taken over all the Humble Company's leases, considering the amount that will be drained to some of its leases and the amount that will be drained from other of its leases, that it will suffer a net drainage of the magnitude you mentioned?

A. Yes, sir.

Q. You spoke of marginal wells awhile ago. What kind of wells do you have in mind?

A. I meant pumping wells which are incapable of producing twenty barrels of oil per day.

Q. You just took, on its face, the Railroad Commission's definition in this order of the 24th of January?

A. Yes, sir.

(Witness excused.)

Mr. Baker: That is all we have at this time, but we do have some evidence as to adjustment of allowable which we will wish to introduce in evidence, but we cannot do so at this time. We will have to get our information from the records. We would like to be permitted to introduce that a little later.

Judge Sibley: All right. You wish to rest, then, at this point, but you reserve the right to supplement the record in the particular you speak of?

Mr. Baker: Yes, sir, and to rebut whatever may come up.

Mr. Hart: There was certain information which Mr. Sorenson said he would get for us, and we will want to further [fol. 264] cross-examine him on the basis of that.

Mr. Fischer: I have no further testimony.

The court then, at 12:00 o'clock noon, recessed until 2:00 o'clock p. m., of the same day, at which time the following proceedings were had:

[fol. 265] Afternoon Session

2:00 o'clock

Judge Sibley: Governor Moody, I believe it is your time.

Mr. Moody: Yes, sir. Shall I proceed, Your Honor?

Judge Sibley: Yes, sir.

OFFER IN EVIDENCE

Mr. Moody: May it please the Court, in support of Rowan & Nichols Oil Company's application for temporary injunction, the complainant offers as an affidavit Complainant's

Original Bill of Complaint, which is verified and also offers Complainant's Supplemental Bill of Complaint.

Mr. Hart: If the Court please, we object to this. I understood that this was going to be tried on oral testimony, and I understood that no affidavits were to be used.

Judge Sibley: Well, that was not specifically stated. I think that Governor Moody declined to go into a final hearing, but stated that he would submit only his application for temporary injunction. Isn't that true, Governor?

Mr. Moody: No, I didn't say that exactly, Your Honor. I said that we would press our application for interlocutory injunction or temporary injunction, but that we would during the trial offer to submit the case on the merits.

Judge Sibley: Yes, sir; all right, well, wouldn't this being true, then, that as far as the temporary injunction [fol. 266] was concerned, he could use his bill as an affidavit, but it would not be available for consideration on the final decree?

Mr. Moody: That is correct.

Mr. Hart: Who swore to that?

Mr. Moody: Mr. Rowan.

Mr. Hart: Mr. Rowan is here and can testify.

Mr. Moody: Yes, sir, Mr. Rowan is here. Our understanding is that the Court will not hear oral testimony on an application for interlocutory injunction.

Judge Sibley: Well, it is discretionary, but we usually do not do so.

Mr. Hart: May I ask this, will it be necessary for the Commission to put its evidence in affidavit form?

Judge Sibley: No, I don't think so. I am just speaking for myself, but we are willing to take oral testimony when it is offered.

Mr. Hart. Yes, sir.

OFFERS IN EVIDENCE

Mr. Moody: May it please the Court, I do not want to be unduly insistent about this part, but in an effort to keep the record straight, so far as my side of the case is concerned, I desire to offer in evidence the Exhibits Nos. 1, 2, 3, 4, 5, 6, and 7 offered by the Humble Oil & Refining Company and identified and proven up by the witness, Sorenson; and then I desire to offer also his direct examination and his answers to such questions as were propounded to him by me. I then desire to offer in evidence these Exhibits

8, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25, offered in evidence by the Humble Oil & Refining Company, and proved up by the witness T. V. Moore, and so much of the [fol. 267] direct testimony of the witness T. V. Moore as was in explanation of the exhibits offered now by Rowan & Nichols. And then I also desire to offer the answers of the witness T. V. Moore to such questions as were propounded to him by me.

Judge Sibley: They are all in evidence.

Mr. Moody: Sir?

Judge Sibley: They are all in evidence, I say.

Mr. Moody: Yes, sir. Then I also desire to offer in evidence a copy of the order of the Railroad Commission of date December 20, 1939, prescribing the present plan of proration for the East Texas field, except as it was subsequently modified by the orders of January 24, 1940, which are included in these exhibits that I mentioned; and in offering the copy of the order of December 20, 1939, I am offering the copy attached to the Complainant's Original Bill of Complaint and identified as Exhibit "C," and Mr. Hart and I have an understanding that if that is not a correct copy of the order, why, that it may be—any mistakes that have been made in copying may be corrected, so as to make it truly conform to the order. I think it is a true copy of the order. Is that not right and satisfactory, Mr. Hart?

Mr. Hart: Yes, sir.

Mr. Moody: We have two witnesses. Does Your Honor care to swear both witnesses at the same time?

Judge Sibley: Yes, the Clerk may swear the witnesses.

Thereupon, two witnesses were sworn by the Clerk.

[fol. 268] A. H. Rowan, having been duly sworn, testified as follows:

Direct examination.

Questions by Mr. Moody:

Q. State your name, please.

A. A. H. Rowan.

Q. Where do you live, Mr. Rowan?

A. Fort Worth, Texas.

Q. What business are you engaged in?

A. I am engaged in the oil business and the drilling contracting business.

Q. Are you in any way connected with the Rowan & Nichols Oil Company?

A. I am President of that Company.

Q. Is Rowan & Nichols Oil Company a corporation?

A. Yes, sir.

Q. State to the Court, please, Mr. Rowan, the experience you have had as a practical oil operator.

A. Well, I have been engaged in the drilling and contracting business since January 1, 1924, for myself, and since shortly after that I have been engaged in producing for myself.

Q. All right. Has that drilling business involved the drilling and completion of wells in various fields in Texas and other states?

A. Yes, sir, in Texas and Louisiana and Oklahoma and Arkansas and New Mexico.

Q. Have you drilled wells in the various sections of Texas where oil is produced—I mean by that, East Texas, the [fol. 269] Gulf Coast area, West Texas, Central Texas, and the Plains country.

A. Yes, sir, I have, in all of those places.

Q. Have you had actual contact with drilling operations in the completion of wells?

A. Yes, sir, I have.

Q. Have you made a study of the oil-bearing sands and formations in which oil is found in this country?

A. Yes, sir.

Q. And a study of cores and things of that kind?

A. Yes, sir, I have.

Q. In addition to your operations as a drilling contractor, you own production, do you?

A. Yes, sir, I do.

Q. Mr. Rowan, involved in this suit is a tract of land known as the Rowan & Nichols Todd "A" lease in the Castleberry Survey in Gregg County, Texas.

A. Yes, sir.

Q. Does the Rowan & Nichols Oil Company have an oil and gas lease covering that?

A. Yes, sir, they do.

Q. Covering that tract of land?

A. Yes, sir.

Q. What is the ownership of Rowan & Nichols Oil Company in the tract of land, with respect to whether it is a

royalty interest or a working interest, and if a working interest, what part of the working interest?

A. We own a seven-eighths leasehold estate.

Q. Are you drilling on the lease now?

A. Yes, sir.

[fol. 270] Q. How many acres are in that lease?

A. There is 28.25 acres.

Q. Yes, sir. How many wells have been drilled on the lease?

A. Seven wells.

Q. Seven wells?

A. Yes, sir.

Q. Mr. Rowan, this suit complains of the order of the Railroad Commission that was adopted on December 20, or promulgated on December 20, 1939, effective January 1, 1940, and by supplemental order—two orders promulgated on January 24, 1940, effective February 1, 1940. Have you made—has Rowan & Nichols caused application to be made to the Railroad Commission for relief from what that company believes to be the inequities that it suffers from the enforcement of those orders?

A. Prior to the institution of this suit, yes, sir, we did make an application.

Q. Has any action been taken by the Commission in granting your application?

A. Not that I know of, no, sir.

Q. Now, are you familiar with how the wells on the Todd "A" lease were drilled and completed?

A. Yes, sir, I am familiar with it.

Q. Are you familiar with—were you present when potential tests were taken on that lease?

A. Yes, sir, I was.

Q. How many potential tests were taken on the lease?

A. I believe there were two tests taken, Governor.

Q. Do you know what those—how were they taken?

A. Well, they were taken in accordance with the orders of the Railroad Commission. The last test was taken on [fol. 271] a two-hour period, with two four-inch flow lines coming off the casing, and one four-inch flow line coming off the tubing. I believe then the two-hour gauge was divided in two, and that gave you the hourly potential of that well.

Q. Do you remember what the hourly potential of that well was, so tested?

A. 964 barrels, I believe.

Q. Was that test taken under the supervision of an employee of the Railroad Commission?

A. Yes, sir, they had the resident engineer in East Texas present.

Q. Now, the, do you know what—have you examined the proration schedule promulgated by the Railroad Commission, to ascertain what potentials they allow the wells on this lease at the present time?

A. Yes, sir, I have. They allow a potential varying from 960 to 965 barrels.

Q. That is, I understand that one or more of the wells is allowed a 960 barrel potential, and one or more allowed 965?

A. Yes, sir.

Q. They are all between those figures?

A. Yes, sir, they are all between those figures.

Q. Those seven wells?

A. Yes, sir.

Q. Now, is that shown, Mr. Rowan, in this proration schedule for February, 1940, marked Plaintiff's Exhibit No. 11?

A. I don't believe it is, Governor.

Q. It does not show in that?

A. I don't believe it shows in that.

[fol. 272] Mr. Moody: I do not desire to offer all that in evidence, just as to Rowan & Nichols Oil Company.

Mr. Hart: I don't believe we will have any objection, if the Court please.

Q. Do you have here available a copy of the Railroad Commission's potential, or, rather, proration schedule as is put—as is had in the office of the Railroad Commission?

A. Yes, sir, we brought a copy of it from Mr. Byrom, and it is represented to us as being a true copy.

Q. All right. Now, does that show what potentials they, the Railroad Commission, allows these wells in figuring the allowable under this order of January 24, 1940?

A. Yes, it does.

Q. What potentials do they allow the wells?

A. On the Todd "A" lease?

Q. Yes, sir.

A. It varies from 960 to 965 barrels.

Q. All right. Now, does this schedule show the—were you present when bottom hole pressure tests were made on the lease—on the wells on the Todd "A" lease?

A. No, sir, I don't think there has ever been a bottom hole pressure test made on any well on that lease.

Q. Have you examined the Railroad Commission's bottom hole pressure map?

A. Yes, sir.

Q. Their contour map showing the bottom hole pressures in the field?

A. Yes, sir, I have seen the map.

Q. Do you know what that—the bottom hole pressure [fol. 273] map shows the wells on this Todd "A" lease is?

A. I don't know what the latest map shows; that schedule shows that they have 1115 pounds.

Q. You mean that the Railroad Commission's proration schedule shows these wells to have 1115 pounds bottom hole pressure?

A. Yes, sir.

Q. Now, Mr. Rowan, have you examined the Railroad Commission's sand thickness map, identified in this record as Plaintiff's Exhibit 4, to see what that map shows with respect to the sand thickness under the Rowan & Nichols Todd "A" lease?

A. Yes, sir.

Q. What does it show?

A. It shows it is between 90 and 100-foot contour line.

Q. Now, is the 100-foot contour line at the west edge of the lease, and the 90-foot contour line at the east edge of the lease?

A. Yes, sir, the 100-foot contour line almost touches the northwest corner of the lease, and the 90-foot is just a little bit southeast of the corner of the lease.

Q. Mr. Rowan, is the lease longer east and west than it is north and south?

A. It is longer east and west.

Q. Than it is north and south?

A. Than it is north and south.

Q. Now, have you examined the Railroad Commission's proration schedule to see what sand thickness the schedule allowed to Rowan & Nichols Todd "A" lease?

A. Yes, sir, I have; the various wells are given an allowance of from 90 feet to 98 feet, and the average is about 94 feet.

Q. All right. Wh*ile* wells is it that are allowed 98 feet [fol. 274] of sand thickness?

A. The ones that are to the west.

Q. Now, Mr. Rowan, do you know the number of wells that have been drilled and that are now producing in the East Texas field?

A. There are approximately 25,900.

Q. You do not have that figure exactly from this proration schedule?

A. No, sir, but it is close to that.

Q. Now, how much oil are the wells of Rowan & Nichols on its Todd "A" lease allowed to produce under this proration schedule?

A. The total barrels of each individual well?

Q. Well, you might give it to me, the allowable fixed by the proration schedule for the lease, and then state the allowables to each of the wells, please sir.

A. The total allowable is 210.56 barrels for the entire lease, and the wells range from slightly over 36 barrels a day to a top of 38 barrels per day.

Q. Do you know what the average for the seven wells is?

A. The average is about 37 barrels.

Q. Now, then, are you acquainted with the Wood lease—the tract or lease known as the Wood tract in the Castleberry Survey adjoining Rowan & Nichols Todd "B" lease?

A. Yes, sir, I am.

Q. How far is that lease——

Mr. Hart: If the Court please, we want to object to any testimony about specific leases. In the first place, there is no evidence that this particular lease will have any effect upon the plaintiff's lease, and in the second place, the [fol. 275] particular examples won't have any bearing on the issue in this case, which is whether the Rowan & Nichols Oil Company lease is getting its fair share, considering the field as a whole.

Mr. Moody: I think, Your Honor, I will meet his objection in a moment.

Q. Mr. Rowan, are you prepared to testify as to whether or not oil in the East Texas field has a tendency under

present conditions of production in the field, to move to the east?

A. Yes, sir, it does.

Mr. Hart: If the Court please, we want to object to any question or to any questions that may be directed to Mr. Rowan on the basis of—that would require an opinion as an expert, because Mr. Rowan has not been qualified as an engineer or a geologist to testify about conditions in the East Texas field.

Judge Sibley: He said he has had fifteen years' experience. That would make him an expert. That is what "expert" really means, is experience.

Mr. Hart: Well, my objection is that unless a man is known to have the training and be qualified as an expert, he cannot give his expert opinion on a matter.

Judge Sibley: Well, it might have effect on the weight of it in considering whether his opinion is likely to be weighty or not, but I think practical experience is one way of becoming an expert.

Mr. Hart: We further object that under the evidence in this case, it is not shown that Mr. Rowan is qualified in any respect to give his expert opinion, and we except to the [fol. 276] ruling of the Court.

Q. Mr. Rowan, included in that fifteen years' experience or so that you had in the—or more; I believe you said 1921 you went into the drilling business, did you not?

A. 1924, sixteen years.

Q. All right, sixteen years. Mr. Rowan, included in that experience have you had experience in drilling oil wells and completing oil wells in the East Texas field, besides your own?

A. Yes, sir, many of them.

Q. Has that drilling been done under your supervision?

A. It has, yes, sir.

Q. You had charge of that?

A. Yes, sir.

Q. Have you drilled wells in all parts of the field?

A. Yes, sir, we have, substantially all parts of the field.

Q. Do you know generally the character of the sands found in that field, the depth at which they are found, the thickness in various portions of the field, the productivity of wells in various sections of the field?

A. Yes, sir.

Q. Are you familiar with the pressures that obtain in that field?

A. I have looked at the Railroad Commission's pressure contour map.

Q. Well, you are acquainted with the records the Railroad Commission has of pressures, then?

A. Yes, sir.

Q. Mr. Rowan, where is the thickest part of the oil sand in the field?

[fol. 277] A. The thickest part is in the middle of the field—the middle one-third.

Q. You mean by that running from north to south, or east to west?

A. Running from east to west.

Q. You mean cross-wise of the field, or length-wise?

A. Well, the thickest part is in the middle of the field, going from west to east.

Q. Well, it averages about four miles across the field, that way?

A. Well, it averages about four miles, yes, sir.

Q. In width?

A. Yes, sir.

Q. Now, what I am trying to get at, does the thick part of the field run length-wise of the field, or cross-wise of the field?

A. It runs north and south.

Q. All right. Now, are you familiar with the part of the field under which water is found—do you know where that is?

A. Yes, sir, it is on the west side of the field.

Q. Are you familiar with the part of the field where an impervious rock is found?

A. Yes, sir, it is on the east side.

Q. On the east side. Now, from your experience in drilling in the field and from your studying of maps and records pertaining to this field, particularly the maps of the Railroad Commission, do you know where the lower pressures are in the East Texas oil field?

A. Yes, sir.

Q. What part of the field are they in?

[fol. 278] A. There is a pressure gradient from west to east, and the lowest pressures are on the east.

Q. All right. Are you familiar, from examination, from being on the ground, and from knowledge of the Rowan &

Nichols Todd "A" lease, and knowledge of drilling that has been over to the east of that lease, whether or not the drilling—there is denser drilling in a large area east of that lease than the actual drilling on the Todd "A" lease?

A. Yes, sir, there is.

Q. You mean that the drilling to the east is denser?

A. I mean that the drilling to the east is denser.

Q. All right. From your experience in the operation of oil wells and the drilling of oil wells, and your study of the East Texas field, what are the facts with respect to whether or not oil drains from points of higher pressure to points of lower pressure?

A. Oil will drain from points of higher pressure to points of lower pressure.

Q. All right. Are the pressures on the Rowan & Nichols Todd "A" lease higher or lower than the pressures in the area to the east of the Todd "A" lease?

A. They are higher.

Q. What is your opinion with respect to whether or not the denser drilling to the east of the Todd lease—the fact that the drilling over there is denser than on the Todd lease, and lower pressures east of the Todd lease—what is your opinion as to whether or not oil drains from the Todd lease toward the areas of lower pressure and denser drilling?

[fol. 279] A. It is my opinion that the oil drains to the lower pressures on the east from our properties.

Q. All right. Now, then, are there areas in the east of that field and east of the Todd lease where the drilling is in places down to a fraction of an acre per well?

A. Yes, sir.

Q. Are you acquainted with the Wood lease that adjoins the Todd "B" lease?

A. I am, yes, sir.

Q. How far is the Todd "B" lease from Rowan & Nichols's Todd "A" lease?

A. I didn't get that question.

Q. How far is it from the Rowan & Nichols' Todd "A" lease to the Rowan & Nichols' Todd "B" lease?

A. It is about 1100 feet.

Q. Now, does the Wood tract adjoin—is it more than 1100 feet from the Todd "A" lease?

A. Yes, sir, it is more than 1100; it is across the "B" lease, which is 580 feet wide.

Q. Are you familiar with the—do you know about the area of the Wood lease?

A. Yes, sir, I know about the area of it.

Q. What is its area?

A. Its area is about a third of an acre.

Q. Since the prior Rowan & Nichols Oil Company lawsuit was tried, has there been a lawsuit over that particular tract of land, upon which you base your statement now that it is about a third of an acre?

A. Yes, sir, there was a lawsuit in Tyler in the United States District Court; the Shell sued Wood, and the United [fol. 280] States District Court for the Tyler Division established the northern boundary of the Shell-Basham lease, which established the southern boundary of the Wood tract.

Q. All right, sir; that is the basis on which you say it is about a third of an acre?

A. Yes, sir; and the distance between the Shell lease and our Todd "B" lease, which is the land that Wood is claiming, is about a third of an acre now.

Q. All right. Now, how many wells have been drilled on this Wood lease?

A. One well.

Q. Do you know what the Railroad Commission gives as the sand thickness there?

A. Yes, sir, 89 feet.

Q. Do you know what the Railroad Commission gives as the potential of the Wood well?

A. 960 barrels.

Q. Do you know what the Railroad Commission gives as the bottom hole pressure on the Wood lease?

A. 1110 pounds.

Q. Do you know what allowable is granted to the well on the Wood lease?

A. Slightly over 24 barrels.

Q. Now, then, do you know how much that lease—have you calculated how much oil that lease is allowed to produce per hundred acres of oil-bearing sand—hundred acre-feet per day, I mean?

A. About 81 barrels per day per hundred acre-feet.

[fol. 281] Q. All right. How much are you allowed to produce, or is Rowan & Nichols Oil Company allowed to produce per day per hundred acre-feet of sand on the Rowan & Nichols Todd "A" lease?

A. Well, using the Railroad Commission's sand thickness map, we are allowed to produce 10.19 barrels per hundred acre-feet.

Q. 10.19 barrels per day per 100 acre-feet?

A. Yes, sir.

Q. Approximately one-eighth of what the Wood well is allowed?

A. Just about 1/8th, yes, sir.

Q. Are the—the sand thicknesses in Rowan & Nichols Todd "A" lease are a little greater than they are on the Wood tract?

A. Yes, sir, we have more sand thickness.

Q. The potentials are about the same?

A. The potentials are about the same, a little higher on our lease.

Q. And the bottom hole pressure is about——

A. It averages 5 pounds higher on our lease than it does on the Wood.

Q. In order to relate the facts with respect to the Todd "A" lease with respect to the facts of the Todd "B" lease, how many acres were in the Todd "B" lease involved in the trial of Rowan & Nichols case?

A. 25 acres.

Q. Do you know what the potential of the wells on that lease were?

A. It run about the same, from about 960 to about 965.

[fol. 282] Q. Do you know what the bottom hole pressure was?

A. Well, it went from about 1,115 to about 1,110.

Q. Do you remember what the sand thickness was there?

A. The sand thickness was just slightly less than on the "A" lease, run from about 89, maybe, to 95.

Q. How much oil are you allowed to produce per day off of the Todd "B" lease under the present order?

A. Under the orders of the Railroad Commission?

Q. Yes.

A. 205 barrels.

Q. That is what it would calculate under the proration order now in force?

A. Yes, sir.

Q. Now, Mr. Rowan, have you made any calculations of the leases lying to the east of the Rowan & Nichols Todd "A" lease?

A. Yes, sir, I made some calculations.

Q. I will let you mark this.

(Thereupon said instrument was marked for identification as Plaintiff's Exhibit No. 26.)

Q. Mr. Rowan, the Reporter has marked this Plaintiff's Exhibit 26. Will you state the—where the—on this exhibit, the leases are shown under the—by the name of the lessee under the column headed "Company and lease," is it not?

A. That is correct.

Q. Then there is a column showing the acreage of the lease?

A. Yes, sir.

Q. And the sand thickness?

A. Yes, sir.

Q. The acre feet of sand?

A. Yes, sir.

[fol. 283] Q. The allowable for each lease respectively?

A. That is correct.

Q. The density of drilling?

A. Correct.

Q. And then the column to the right shows the barrels per 100 acre-feet of sand, is that correct?

A. Yes, sir.

Q. Where are the leases that are shown on this list located with respect to Rowan & Nichols Todd "A" lease?

A. These leases all lie in an easterly direction from the Todd "A" lease, and they are located in the Castleberry Survey, or the Robinson Survey.

Q. Is the Castleberry Survey the same survey the Rowan & Nichols Todd "A" is located in?

A. Yes, sir.

Q. Where does the Robinson lease lie with respect to the Castleberry lease?

A. It joins the Castleberry survey on the east.

Q. Are these leases all located in the direction in which you say drainage is taking place from your lease to the east?

A. Yes, sir.

Q. Or from the Rowan & Nichols Todd "A" lease?

A. Yes, sir.

Q. Does that column to the right—to the acreage shown—where do you get the data from which you show the acreage for these respective leases?

A. I got it from the Railroad Commission schedule.

Q. When you say Railroad Commission schedule do you mean Railroad Commission proration schedule?

A. I mean the schedule they prepared, they worked their proration schedule up from.

[fol. 284] Q. It is from the Railroad—it is from the records of the Railroad Commission then, whatever the name of it would be?

A. Yes, sir.

Q. As far as sand thickness is concerned, as shown on this exhibit, where did you get the facts as to that?

A. I got it out of the Railroad Commission records also, the same schedule we got the allowables from, the density.

Q. Acre-feet of sand. That figure is figured from the acreage of sand thickness, isn't it?

A. Yes, sir, that is a multiplication of the two.

Q. You computed that yourself?

A. Yes, sir.

Q. Where do you get the allowables of these several leases?

A. Out of their schedules.

Q. Out of the Railroad Commission records?

A. Yes, sir.

Q. Where do you get the record as to density, as shown on this list?

A. Out of the Railroad Commission schedule.

Q. The final column to the right, you compute the number of barrels these leases are allowed to produce, respectively?

A. That is a mathematical computation.

Q. Which you made, and you think they are made accurately?

A. Yes, sir.

Q. That shows Rowan & Nichols produced 10.11 barrels per cubic acre foot, and the top one on there, is 45.21 barrels per 100 acre feet.

A. That one right underneath the Rowan & Nichols.

Q. In this column marked "barrels per 100 acre-feet," that is barrels per day per 100 acre-feet, isn't it?

[fol. 285] A. That is correct.

Q. This 100 acre-feet means 100 acre-feet of productive sand?

A. Yes, sir.

Mr. Moody: We offer this schedule in evidence, if the Court please.

(Thereupon said schedule was admitted in evidence as Plaintiff's Exhibit No. 26.)

Q. In that part of the field, what are the facts—I mean, where these leases are located as shown on that list, other than the Rowan & Nichols Todd "A" lease, what are the facts with respect to whether that is a part of the field in which the pressures are lower, according to the Railroad Commission records, than the pressure on your lease?

A. They are lower, yes, sir.

Q. In that regard, let me ask you this question. Are you in accord with the records of the Railroad Commission in so far as they show that this area to the east has a lower bottom hole pressure than the Rowan & Nichols Todd "A" lease?

A. Yes, I think the pressure contour map as made up by the Railroad Commission is substantially correct.

Q. All right. Mr. Rowan, do you have figures on the amount of oil that has been produced to date from Rowan & Nichols Todd "A" lease?

A. Yes, sir, I have them.

Q. Will you state the figure, please, sir.

A. The total production through January 1, 1940 was 493,120 barrels.

Q. 493,120 barrels. To what date is that?

A. January 1, 1940.

Q. 493,120. Have you calculated what per cent that is of the total amount of oil produced from the East Texas Field to that same date?

[fol. 286] A. In percentage, it — .0340594.

Mr. Hart: Would you mind giving that again, please, sir.

A. In percentage it is .0340594.

By Mr. Moody:

Q. Now then, have you calculated that number of acre-feet of oil bearing sands under the Rowan & Nichols Todd "A" lease?

A. Yes, sir, I have that. According to the Railroad Commission's sand thickness map——

Q. Isn't it shown here on this schedule—2627?

A. 2627 is correct.

Q. Have you calculated what percent of the—is it on the Railroad Commission map, is it different from the 2627?

A. Yes, sir, slightly different. On the Railroad Commission map it is 2657.

Q. The Railroad Commission is 2657?

A. Yes, sir.

Q. And your figures on it are 2627?

A. Yes, sir.

Q. The Railroad Commission gave you 30 acre-feet more oil sand than you figured?

A. My engineer figured it, slightly less than that.

Q. Have you calculated what percent of the total acre-feet of oil producing sand in the entire sand is under the Rowan & Nichols Todd "A" lease? What I am getting at is what percent of the total number of acre-feet of oil bearing sand in the field.

A. What the—on a percentage basis?

Q. Yes, sir, is under the Rowan & Nichols Todd "A" lease.

A. .05355.

[fol. 287] Q. Have you figures that—is that based on the Railroad Commission's 2657 or on your figure of 2627?

A. 2657.

Q. And that is in percent?

A. Yes, sir, percent.

Q. Then, forgetting the last figures, you have .05 of 1% of the net oil sand in the field and have produced to date .03 of 1% of the amount of oil produced in the field?

A. That is correct.

Q. Mr. Rowan have you the—the present order, I believe, allows about 690 or 691,000 barrels of oil to be produced daily from the East Texas Field for four days a week.

A. 690,000, yes, sir.

Q. Have you calculated that on the, average it out to determine—for the month of February, the month of 29 days, how much that would average per day?

A. On the basis of February, with 12 shutdown days, 17 producing days, it would average 404,483 a day.

Q. What does that make the average daily production from Rowan & Nichols Todd "A" lease amount to for February, 29 days?

A. For the month of February, it amounts to 152.74 barrels per day over the 29 day period.

Q. Now, have you figured that fractional part of that daily field allowable, so averaged, Rowan & Nichols Oil Company is allowed to produce from its Todd "A" lease?

A. A fractional part of 690,000 is 37—a little better than 37/10,000ths.

Q. The Rowan & Nichols Todd "A" lease produces 37/10,000ths of the field allowable?

A. That is correct.

[fol. 288] That is, as against .05% of the productive sand in the field?

A. Yes, sir.

Q. On that basis of proration, what is your opinion with respect to whether or not Rowan & Nichols Oil Company's lease is being drained to contribute to the production of other leases that have a larger production per day per 100 acre-feet of sand?

A. I think there is no question about that, that it is being drained.

Q. Is that, or not, the necessary effect of the present order of the Railroad Commission?

A. Yes, sir, it is.

Q. Now,—do you know how many barrels of the daily field allowable—have you calculated how many barrels of the daily field allowable is distributed among wells on the 20 barrels per day minimum?

A. 73.46%.

Q. In barrels, can you give me that?

A. 506,920.

Q. Do you know how many barrels of the daily allowable of 690,000 is allocated to the so-called marginal wells?

A. About 6,500.

Q. About how many barrels of the daily field allowable remains for distribution on the formula adopted by the Railroad Commission, not including the 20 barrels that is put into that formula?

A. Approximately 176,000 barrels.

Q. State the percentage, please, sir, of the daily field allowable that is allocated among wells on the per well basis [fol. 289] of 20 barrels to the well.

A. It is 73.46%.

Q. What percent of the daily field allowable is allocated to the so-called marginal wells?

A. Well, it is less than 1%.

Q. About .95 of 1%.

A. About .95 of 1%.

Q. What percentage of the daily field allowable is allocated among wells on the formula that the Railroad Commission has prescribed of acreage times bottom hole pres-

sure times potential over the total of those factors, those same factors, for the entire field?

A. It is 25.58%.

Q. On your lease, on the Todd "A" lease, how much of the daily allowable is allocated to that lease by the application of the formula, not including the 20 barrel minimum per day?

A. On the percentage basis or——

Q. No, on the barrelage basis.

A. At 20 barrels?

Q. Now, the acreage—on a percentage basis, how much of the proratable oil under the present order, and by proratable oil, I mean 176,522 barrels that is distributed among wells on the formula basis, what fractional part of the proratable oil is allocated to this lease on the formula basis?

A. It is 68/10,000ths part.

Q. That is 68/—.

A. 68/10,000ths part. It is .00068.

Q. Isn't that 68/100,000ths?

A. 68/100,000ths.

[fol. 290] Q. Have you calculated how much of the proratable oil under that order that was in force in June of last year, that order involved in the prior Rowan & Nichols case, have you calculated how much of the proratable oil under that order was allowed to this Todd "A" lease over and above the 20 barrels per well?

A. That is 2/1,000ths part.

Q. In other words, under the order that was involved in the prior Rowan & Nichols case, where there were 7,000 barrels of proratable oil, you got more proratable oil under that formula to this lease than you do under the present formula?

A. On a percentage basis, yes, sir.

Q. Mr. Rowan, have you undertaken to make figures—first, I will ask you this. Do you recall what the field allowable was under the proration order in effect in the first Rowan & Nichols case, last November?

A. 527,000 barrels.

Q. Have you undertaken to make figures based on that field allowable of 527,000 barrels, with 7,000 barrels of it, or rather, about 515,000 barrels of it taken up on a per well basis; of that 7,000 barrels allocated on the basis of 2.32% of the potential, and determined if this field had now 522,000 barrels allowable, as it had then, instead of the

present 690,000 barrel allowable, have you undertaken to figure out how much oil the Rowan & Nichols Todd "A" lease would get then because of the then field allowable of 527,000 barrels, 515,000 of it being allocated on the formula of the Railroad Commission, excepting the formula by the 20 barrel minimum?

A. Yes, sir.

[fol. 291] Q. What are the facts?

A. If you take the present formula and reduce the field allowable back down to 522,000 barrels, and allocate 20 barrels of that to each well, you have about 7,000 barrels left, which is allocated under this formula, but then we would get on the Todd "A" lease a total of 4.68 barrels on the 7 wells. We would get .699 barrels per well.

Q. All right. How much did you get under the old order?

A. We got 14 barrels under the old order, slightly over 14.

Q. If you will apply that formula to the facts that existed under the old order, instead of getting for this lease 14 barrels of prorated oil, you would only get——

A. 4.68.

Q. 4.68 barrels.

A. That is right.

Q. Mr. Rowan, from your experience as a practical oil operator and from your study of the facts and figures and application of this order to Rowan & Nichols, Todd "A", lease, in your opinion, will the enforcement of the present form of proration as provided in that order of January 24, 1940, will that permit Rowan & Nichols Oil Company to produce from its Todd "A" lease during the life of the field the equivalent of the recoverable oil now under that lease?

A. No, sir, I don't think it will.

Q. Do you think that presently, I mean from day to day, now, as that order is being enforced, and controlling the production from the Todd "A" lease, do you think it is from day to day preventing the Rowan & Nichols Company from producing oil from that lease in proper proportion to that allowed to be produced in the field?

[fol. 292] A. Yes, sir, I do.

Q. The Railroad Commission is now enforcing the order against the Rowan & Nichols Todd "A" lease?

A. Yes, sir.

Q. And it is being operated in conformity with the order of January 24, 1940?

A. That is correct.

Q. Take the witness—Mr. Rowan—Your Honor, it is suggested I ask another question. You say you have had experience in operating oil wells?

A. Yes, sir, I have.

Q. Some of your own, and some of other people's?

A. Yes, sir.

Q. Are you familiar with the cost of operating flowing wells, and the cost of operating pumping wells in the East Texas Oil Field?

A. I am familiar with the cost of operating pumping wells over there, and I am familiar with what it ought to cost to operate a pumping well, yes, sir. I think I could say.

Q. In your opinion, can a pumping well in the East Texas Field be operated on an allowable of five barrels a day, and a profit be made on the operation?

A. Yes, sir, it can.

Q. Have you undertaken to calculate with the values of the oil, the cost of operation, the amount of taxes, the expenses, the royalty that would accrue on such an operation and determined that on five barrels a well can be pumped at a profit, five barrels a day, a well can be pumped at a profit in the East Texas Field?

A. Yes, sir, I have.

[fol. 293] Q. By the way, what is the present reasonable market value of oil in the East Texas Field?

A. $1.10 a barrel.

Q. Now then, along that same line, do you know whether or not in various fields in this state wells are being operated on an allowable of less than five barrels, where the conditions are comparable to the conditions in the East Texas Field?

A. Yes, sir, they are.

Mr. Hart: We wish to object to that, unless there is some proof about what fields they are talking about, and some proof that conditions are comparable.

Judge Sibley: Hadn't we better stick to this field?

Mr. Moody: Perhaps we had better.

Q. Do you know whether or not wells are now being operated in the East Texas Field that are producing less than five barrels of oil a day?

A. I know some that are producing five barrels a day.
Q. And they are operating?
A. Yes, sir.
Q. All right.

Cross-examination.

Questions by Mr. Baker:

Q. Mr. Bowan, isn't it a fact that there are a number of wells in the East Texas Field which have been operated over a considerable period of time, pumping wells, producing less than five barrels a day?
A. According to the Railroad—according to the Railroad Commission schedule, yes, sir.
[fol. 294] Q. They have been submitted, up to this order, to the shut-down, along with other wells, haven't they?
A. That is correct.

Cross-examination.

Questions by Mr. Fischer:

Q. Now, what do you mean when you say they operate a well on five barrels a day. Do you mean five barrels will pay the pumper, pay the expenses of pumping and taxes? Is that what you mean?
A. That is correct.
Q. Well, would five barrels a day return you the investment that you have got to pay for your lease, the cost of drilling the well, return your investment with interest on your investment, and your upkeep and your taxes?
A. I didn't say that, Mr. Fischer.
Q. Well, all right. You take an oil well—you dig an oil well, and you figure on getting back your investment, don't you?
A. I do when I drill one. I don't always do it, though.
Q. We are talking about one that is going to get it back. If you drill an oil well you figure on getting back your cost of your lease to start with, don't you?
A. If I drill it, yes, sir.
Q. And the cost of your development, and your digging the well, and your pump and equipment?
A. Yes, sir.
Q. You also figure on a reasonable interest return on your investment?
A. Yes, sir.

Q. You figure it about 10% in the oil business, don't you, [fol. 295] that is reasonable?

A. I like to make that. I haven't been able to do it so far.

Q. Don't you figure that is a reasonable return on your investment?

A. I would say it would be mighty nice, if they would let me make it.

Q. You figure to get a return back, and interest on your investment?

A. Yes, sir.

Q. And then you have to pay the expenses of your operation in addition to your capital investment?

A. Yes, sir.

Q. Did you ever figure how many barrels it would take to get your money back on that basis?

A. I know how many barrels it would take to get my money back.

Q. How many barrels a day would it take in the East Texas Field in the fairway to get your money back?

A. I never figured that.

Q. All right. You figured five barrels a day, how much it would cost to pump a well?

A. That is correct. I think you can make a profit on the five barrels a day, and I wouldn't say that would pay his investment back in any reasonable length of time, but if his investment is paid back, and he has got the lease paid for, he can continue to operate the well on five barrels a day, and make a reasonable profit.

Q. You think if he had the lease paid for then, and the development paid for, and the equipment paid for, you can take a lease and operate it on five barrels a day and make a reasonable profit?

[fol. 296] A. Yes, sir.

Q. How much profit do you think he could make?

A. He could make from $75 to $100 a month.

Q. Seventy-five to $100 a month on that basis?

A. Yes, sir.

Q. On that profit, did you ever figure how many years it would take to return his investment with a reasonable profit on his investment?

A. No, sir.

Q. Never did. All right. Just a minute here, I want to look at a note. Now, your leases over there in what you call the fairway.

A. Yes, sir.

Q. Does the oil migrate from west over to your lease?

A. I guess it does, yes, sir.

Q. And you are just like me and the Humble, aren't you, with your lease?

A. I don't know how you and the Humble are, I am trying to run my own business.

Q. Have you got as much oil under your lease today as you had when you started nine years ago?

A. You mean, oil in place?

Q. Yes, sir.

A. Yes, sir.

Q. You have?

A. Yes, sir.

Q. And you have taken out four hundred and some thousand barrels?

A. Yes, sir.

Q. Out of that lease with 7 wells on it?

A. Yes, sir.

[fol. 297] Q. And you have still got as much as you started with?

A. Got as much oil in place, yes, sir.

Q. And you say you will be discriminated against?

A. Yes, sir.

Q. That is all.

Mr. Moody: Mr. Rowan——

Mr. Hart: Do I get a chance at cross-examination?

Mr. Moody: I beg your pardon.

Cross-examination.

Questions by Mr. Hart:

Q. Mr. Rowan, how much were you permitted to produce under the old proration order, that is, the orders in effect in June, 1939, on your Todd "A" lease?

A. It was slightly over 22 barrels a day, I believe, Mr. Hart.

Q. All right, sir. Under your present—under the present schedule you are permitted to produce about 37 barrels a day?

A. It averages out about 37 barrels.

Q. That is an increase of approximately 70%, is it not, in the allowables to your wells between—in the new schedule over the old schedule?

A. That is about right. I haven't figured it, but that is about right.

Q. There was a total increase in the field allowable between the old schedule and the new schedule of only about 30%, wasn't there?

A. That is about right.

Q. And your lease got an increase of about 70%?

A. That is correct.

[fol. 298] Q. So, all of this new proratable oil put into the order by the new order of the Commission went to, almost altogether, to leases like yours in the middle of the field, with thick sands, rather than to the leases on the edges of the field?

A. It went to all of the leases and all of the wells in the field, but the leases in the middle of the field, I think, profited by it more than the leases on the edges.

Q. Now, under the old schedule, you got on your lease about 14 barrels of proratable oil, didn't you?

A. That is correct.

Q. All right, under the new schedule you get about 120 barrels of proratable oil, isn't that right?

A. That is correct.

Q. You get about how many times as much proratable oil under the new schedule as you got under the old schedule?

A. It would be 14 into 120. It would be about 9 times.

Mr. Moody: Eight times.

Mr. Hart: You get eight times as much proratable oil under the new schedule as you got under the old schedule, is that right?

A. That is right.

By Mr. Hart:

Q. You gave some figures here about the percentage of proratable oil you got under the old schedule, and under the new schedule. You don't really contend that gives a fair picture of the relative fairness of the two orders, do you now, Mr. Rowan?

A. No, sir. It shows this, that you raise your allowable, and if you reduce the allowable back down, and take your present formula and use it, under a 522,000 allowable, we would be worse off than we were under the old order. That is all that it shows.

[fol. 299] Q. The reason for that is, isn't is, that under the old order, the only factor that was considered in allocat-

ing the proratable oil, was the potential, and under the new order, in addition to potential, they consider sand thickness, and acreage and bottom hole pressure, and when you consider those additional factors, your percentage of proratable oil is cut down.

A. I guess so.

Q. If you consider potential alone, you would have a little more than that?

A. Yes, sir.

Q. You don't contend that sand thickness and bottom hole pressure and average acreage are not proper factors to go into the proration schedule, do you?

A. No, sir, I don't. I testified in the other suit I thought they were proper factors.

Q. The cut-down in the percentage is due to the fact that the Commission has added some new factors which you say are proper, and in addition, has raised the top allowable, so that you have got about eight times as much top allowable, and other people have got some proratable oil?

A. Not eight times the top allowable.

Q. You get eight times the proratable oil you used to get?

A. Yes, sir, that is right.

Q. I believe you gave the percentage of the acre-feet of sand that your lease now has as compared with the total number of acre-feet of sand now in the field?

A. Yes, sir, I used the Railroad Commission figures.

Q. What do you mean, you used the Railroad Commission figures? The Railroad Commission figures are just original [fol. 300] acre-feet of sand, aren't they?

A. I imagine they are.

Q. You stated, as I understand it, a certain percent of the per acre-feet of sand in the field?

A. No, I said a ratio of what the Railroad Commission gave us on our Todd "A" lease to what they gave the total field.

Q. Is a certain figure?

A. Yes, sir.

Q. The Railroad Commission figure, as shown on that map, is original sand thickness, isn't it?

A. I believe it is, yes, sir.

Q. Do you know what the figure is, or do you have any estimate yourself of the present number of acre-feet of sand in the field?

A. I don't have myself. My engineer may have. He is going to follow me on the witness stand, Mr. Buck. He may have that figure for you.

Q. I don't want to ask you something you don't know.

A. I don't know.

Q. This figure you gave of percentage of acre-feet, whatever you may have said at the time Governor Moody was asking you, was intended to be a percentage of acre-feet of sand in your lease, as compared with the original number of acre-feet of sand in the whole field.

A. In the field. If the Railroad Commission's figures are based on the original, yes, sir.

Q. You have the same number of acre-feet of sand under that lease now that you had when the field was first opened, don't you?

A. That is correct.

[fol. 301] Q. There hasn't been any depletion at all in your lease, so far as the number of acre-feet of oil saturated sand is concerned?

A. No, sir.

Q. I believe that is all.

Mr. Moody: Mr. Rowan,——

Mr. Hart: May I ask one question I forgot?

Q. In this schedule you introduced showing certain leases which you say are generally in an eastward direction from your lease, did you include all of the leases between your lease and the eastern edge of the field in that?

A. No, sir, we did not.

Q. Do you know what percentage of the acreage between your lease, say, and a strip the same width as your lease, to the eastward edge of the field is included in that schedule?

A. Those leases do not necessarily lie in a direct easterly direction. They may lie slightly northeast or southeast.

Q. Mr. Rowan, your Todd "A" lease——

A. And they represent a small percentage.

Q. Only a small percentage?

A. Yes, sir.

Q. Your Todd "A" lease is drilled to what density?

A. Well to 4.03 acres.

Q. And what is the average density of the drilling in the field?

A. I believe it is about one well to five acres.

Q. There has been some testimony here about one well to 5.8 acres?

A. I believe that is right.

Mr. Moody: 5.17.

[fol. 302] A. 5.17. I think that is right.

By Mr. Hart:

Q. You are more densely drilled than the field as a whole?

A. Yes, sir.

Q. Do you know what the density of the section of the field your lease is in is? The density of drilling, is it about the same as the average density of the field, or somewhat less than that?

A. I don't know.

Q. You don't know?

A. No, sir.

Q. Mr. Rowan, do you have available completion dates on your wells on the Todd "A" lease?

A. Yes, sir, I have them.

Q. Do you have them stated there on a sheet of paper that you could just furnish us?

A. Yes, sir, I have them right here. I will hand them to you.

Q. Well, this shows that your well No. 1 was completed on July 22, 1931, and Well No. 7, was completed on August 25, 1934. In other words, about five and a half years ago, why, your lease, your Todd "A" lease, was already more densely drilled than the field is even today?

A. Yes, sir.

Q. Isn't that correct?

A. Yes, sir.

Q. You are more densely drilled—you were more densely drilled when you drilled those wells than the average of the area surrounding you, and the average of the field?

A. Yes, sir.

[fol. 303] Q. You are still more densely drilled than the average of the area surrounding you?

A. I believe immediately surrounding us we are maybe a little bit denser, than the area immediately surrounding us.

Q. Do you know how many barrels per acre your Todd "A" lease has produced to date?

A. Yes, sir.

Q. How many barrels per acre?

A. It is a little over 17,000. I have the exact figure here. It is 17,456 barrels.

Q. Do you know what the average production per acre for the field up to the present time is?

A. I could figure it. I haven't ever figured it, no, sir.

Q. It is about seven or eight thousand barrels, isn't it?

A. I expect that is about right, Mr. Hart.

Q. In other words, you have produced well over twice as much per acre from your Todd "A" lease as the average of the field, haven't you?

A. Yes, sir.

Q. Up to the present time?

A. Yes, sir.

Q. And you have still got the same number of acre-feet of sand under that oil lease as was originally there?

A. That is correct?

Q. Do you know how many of your wells on your Todd "A" lease were drilled as exceptions to Rule 37?

A. I would say all but the first two.

Q. All but the first two. Five out of the seven wells were drilled as exceptions to Rule 37?

A. Yes, sir.

[fol. 304] Q. You drilled those voluntarily, didn't you?

A. Yes, sir.

Q. You asked the permission for permits, and they granted them?

A. Yes, sir.

Q. And you thought they were reasonably necessary when you drilled them, didn't you?

A. Yes, sir.

Q. That is all.

Redirect examination.

Questions by Mr. Moody:

Q. Mr. Rowan, the production per acre that you stated of 17,456 barrels per acre, that is based on surface acreage, is it not?

A. Yes, sir, surface acreage.

Q. Have you calculated the number of barrels recovered per 100 acre-feet of oil sands under that lease?

A. No, sir, I haven't.

Q. And if you have got 28 acres, and you have got 2627—2637 acre-feet of sand.

A. 2627.

Q. It would be about 1/10th, wouldn't it, of the 17,456, or about 1,745 barrels per 100 acre-feet?

A. That is right.

Q. It would be somewhere about 1/10th as much, since an acre foot of sand is about ten times the surface acreage?

A. Yes, that is correct.

Q. Mr. Rowan, you know, do you not, or it is a generally conceded face, is it not, among all people who have studied the field and scientists that have spoken of it, that over on the east and over on the west the sand is very much thinner [fol. 305] than it is in the fairway?

A. Yes, sir.

Q. In undertaking to say how many barrels of oil you have produced per surface acre, does that give any proper appraisal of the amount you may have produced, as compared with what someone may have produced in another part of the field?

A. I don't think so.

Q. Is that true because of the larger storage and reserves of oil under your lease than other places where the sand is thinner and the pressures are lower?

A. That is correct.

Q. What was the date there that you said the first well was completed on your lease?

A. About the middle of 1931.

Q. And—may I see that, Mr. Hart?

Mr. Hart: Yes, sir.

By Mr. Moody:

Q. And the last one was completed, according to this schedule here, in August, 1934.

A. That is right.

Q. In your opinion do you have enough wells on that lease now under any proper or fair plan of proration to produce all of the recoverable oil under that tract?

A. Yes, sir, I think we have more than enough.

Q. You were asked if you had as much oil under the lease now as you had to start with, and you said oil in place. Do you distinguish between oil in place and recoverable oil?

A. Yes, sir.

Q. Why do you distinguish between oil in place and recoverable oil?

A. Oil in place is the amount of oil you have in the reser- [fol. 306] voir, and recoverable oil is the amount of oil you anticipate you will recover.

Q. Do you think you have under your lease now, forming as it does, a part of the East Texas Field, as much recoverable oil as the amount of recoverable oil originally under that lease?

A. No, sir, I do not.

Q. Explain to the Court why that is true.

A. Because of the fact that the water has encroached to the west, I mean to the east, and is continuing to migrate or go to the eastward and upward, and the time element is running against us all of the time. We have to take our oil out, or we won't recover it, before it is drowned out by water, and furthermore, by the fact that the pressures have declined.

Q. Is the movement of that water to the upward position, and eastward, is that pushing oil on beyond you, further to the east?

A. Yes, sir.

Q. Does the—has the production of oil in that field reduced pressures over there?

A. Yes, sir, it has.

Q. Do you know how much the pressures have been reduced on your lease since the field was opened?

A. They were originally about 1,600 pounds, and they are now 1,115. That is bottom hole pressure.

Q. Does the bottom hole pressure contribute to the amount of recoverable oil that exists in a field?

A. I think it does, yes, sir.

Q. Now then, if they have taken out,—if, say, 30% of [fol. 307] the oil that was originally in the field has been already produced, then do you think that you and Mr. Fischer are in as good a fix as you were when you started, although you may have under your lease as much oil as you had when you started?

A. No, sir, I don't.

Q. You think the recoverable oil is less?

A. Yes, sir.

Q. You were asked some questions here about a 70 per cent increase in your allowable, and that the amount of

proratable oil that you get under this order is about eight or nine times as much as it was under the 522,000 barrel allowable?

A. Yes, sir, that is correct.

Q. If you put the factor of the potential in, as was in force under the old order, with a 20 barrel minimum, and distribute the balance above the 20 barrel minimum on a potential factor, as was the case under the old order, do you think you would be getting more than you do under this order?

A. Applied to 690,000?

Q. Yes.

A. Yes, sir, I probably would. I haven't figured it, but I probably would.

Q. So far as the increase, you have—you were getting under the old order 22 barrels per well, about?

A. Yes, sir.

Q. An average of about 37 barrels per well, or 15 barrels more under this order?

A. That is correct.

[fol. 308] Q. But they are producing from the field approximately how many more barrels per day?

A. 170,000.

Q. About 170,000 more barrels per day?

A. Yes, sir.

Q. Now, then, Mr. Rowan, do you think, or can any—can this formula that the Railroad Commission has now, as long as it includes a minimum of 20 barrels per well, can that ever operate to let you produce in proportion to the oil you have along with other persons in the field, or daily produce that per cent of the daily field allowable that the reserves under your lease bear to the total reserves in the field?

A. No, sir, it won't do it.

Q. You were asked some questions about paying interest on an investment. You say that you think you could operate on 5 barrels a day. You could operate a pumping well on 5 barrels a day and make a profit of some—how much was it?

A. I said from seventy-five to a hundred dollars.

Q. Seventy-five to a hundred dollars a month?

A. Yes, sir.

Q. That would be from nine hundred to twelve hundred dollars a year?

A. Yes, sir.

Q. Is that correct?

A. Yes, sir.

Q. How much does it cost to drill a well over there and equip it?

A. Drill and equip it for pumping?

Q. Yes, sir.

[fol. 309] A. It costs about $12,500.

Q. Now, then, the pumping wells, principally, where are they located in the East Texas field?

A. They are located on the extreme east edge and the extreme west edge.

Q. Have you been pretty familiar with the drilling going on in that field over the last two years?

A. Yes, sir.

Q. What are the facts with respect to whether or not substantially all of the present pumping wells in the East Texas oil field have been completed more than two years?

A. I think they have, yes, sir.

Q. Under the allowable that they have been receiving in the East Texas field over the last two years, would a pumping well pay out in two years' time?

A. It would pay out, yes, sir.

Q. So, if these pumping wells have paid out, can they be operated and earn a substantial interest on the investment at 5 barrels to the well?

A. They can, yes, sir.

Q. Mr. Fischer has asked you about earning back the cost of the drilling and equipping on the basis of 5 barrels to the well, and asked you if you meant you could pay the drilling costs and—I mean the proper and operating expenses?

A. Yes, sir.

Q. But do you mean to limit your—I understood you to say yes. Do you mean to limit it to that, or do you mean at a profit of $900 to $1200, as you stated a moment ago?

A. As I understand your question, did I mean that you could make a profit over and above all of that expense?

[fol. 310] Q. Yes.

A. Yes, you could make a profit over and above that expense.

Q. So, if I understood you to tell Mr. Fischer, you could just pay your operating expenses, I misunderstood you?

A. Yes, sir.

Q. Have you been familiar, or have you kept informed on the various orders that the Railroad Commission has had in force in the East Texas field over the past six or eight years?

A. Yes, sir.

Q. And know how the field has been prorated?

A. Yes, sir.

Q. Do you remember when the Railroad Commission started the closing in the field for a certain number of days each week?

A. I believe it has been in the last two years, Governor Moody. I can't give you the exact date.

Q. Was that order—was that shutting in of the field, was that made to apply up to January 24, 1940, was that made to apply as well to pumping wells as to flowing wells?

A. Yes, sir, it was.

Q. Was it made to apply as well to wells that produced less than 20 barrels as it was to wells that produced in excess of 20 barrels?

A. Yes, sir, it was.

Q. Up until the order of January 24, 1940, became effective, did you ever know of the Railroad Commission excepting from the shutdown orders wells in the East Texas field that flowed—that would make less than 20 barrels of oil per [fol. 311] day on the pump or off of the pump?

A. They might have given some exceptions on the west side, but generally speaking, the order applied to the wells, and where they gave an exception, I think they limited them to produce five-sevenths on a seven-day basis.

Q. If they did except them, they produced in seven days what their allowable would be for five?

A. Yes, sir.

Q. In September of the past year wasn't the entire field shut in for a couple of weeks' time, August or September?

A. August or September, yes, sir.

Q. Following the granting of the temporary injunction in the Humble case?

A. Shut in for two weeks, yes, sir.

Q. At other times, the whole field has been shut in for a week or two at a time, has it not?

A. Yes, sir, it has.

Q. These shutdown periods, Mr. Rowan, when the field isn't allowed to produce, do those shutdown periods have the effect or not to cause the oil to move to the places, into

the places where some dense drilling or disproportionate taking of the production of oil, perhaps, have been reduced, so that those parts are re-charged with oil from the more productive portions of the field?

A. I don't think there is any question about it. I think it does.

Q. I believe that is all.

[fol. 312] Recross-examination.

Questions by Mr. Hart:

Q. Mr. Rowan, you talked to—made a distinction between recoverable oil and oil in place. You spoke of, you said your recoverable oil wasn't as much because the water has encroached under the west; the water hasn't encroached under your lease, has it?

A. No, sir.

Q. And all of the oil that you have taken from your wells has been replaced by oil from somewhere else?

A. Yes, sir.

Q. So, you have got as much oil under your lease as you ever had?

A. Yes, sir.

Q. When you talked about recoverable oil and encroachment of water to the west, you mean there is less oil to the west that might be pushed in under your lease to take the place of the oil you produce?

A. Yes, sir.

Q. Then, you and Mr. Fischer are in a worse position now because there is less oil to the west that can be pushed in under your leases?

A. Yes, sir.

Q. You don't mean you have got any less under your own?

A. No, sir, but I mean that unless I am permitted to produce it before the water does drown my lease out, I will lose that amount of oil that I never will be able to recover. I have got to be permitted to produce it currently and before the water drowns my lease out, or else I will never get it.

[fol. 313] Q. All right. Do you own any—does your company own any leases in the East Texas field that have any pumping wells on them?

A. No, sir.

Q. Has it ever owned any leases in the East Texas field with pumping wells on them?

A. No, sir.

Q. You don't have any actual experience with the operation of pumping wells and how much it costs?

A. Not in East Texas. I have had with Woodbine production.

Q. I am talking about East Texas.

A. No, not in East Texas.

Q. Did you get your information about what it would cost to operate pumping wells from the Humble, or who?

A. No, I didn't get it from the Humble. I got it from my experience as an oil man over sixteen years, pumping wells in the Woodbine sands along the Mexia fault lines, and other fields.

Q. You are basing your testimony on your experience in other fields?

A. Yes, sir.

Mr. Hart: That is all.

Redirect examination.

Questions by Mr. Moody:

Q. Mr. Rowan, does Rowan & Nichols Oil Company own any leases in the East Texas field other than Rowan & Nichols Todd "A" lease and Rowan & Nichols Todd "B" lease in the Castleberry Survey?

A. No, sir.

Q. The Todd "B" lease, not involved in this suit, is it [fol. 314] affected by this order in proportion to its acre-feet of sand about the same as the Todd "A" lease involved in this suit?

A. Yes, sir, it is.

Q. That is all.

Judge Sibley: We will take a recess for five minutes.

(Thereupon, court was recessed at 3:30 P. M. until 3:35 P. M., at which time the following proceedings were had:)

Recross-examination.

Questions by Mr. Hart:

Q. Mr. Rowan, when you say five barrels per day on these pumping wells, do you mean five barrels for thirty days a month?

A. Yes, sir, that was my computation.

Q. Well, now, these non-marginal wells don't get to produce under the present order but seventeen days out of the twenty-nine days in February, do they?

A. I assumed those would be flowing wells. And, of course, your lifting costs would be a lot cheaper on a flowing well than a pumping well.

Q. Does this five barrels per day you speak of that you could operate a well with profit, is that a flowing well?

A. No, a pumping well.

Q. Now, the non-marginal pumping wells under the Railroad Commission orders shut down twelve days in the month of February, don't they?

A. I imagine so.

Q. They are allowed to produce only seventeen days?

[fol. 315] A. Yes, sir.

Q. Well, five barrels a day for seventeen days would mean about how much income from that well during that month?

A. It would be about $115.00.

Q. Five times seventeen. It would be about five dollars a day—or what do you figure the price of the oil would be?

A. $1.10. It would be $5.50 a day.

Q. Times seventeen would be how much? It would be about $95.00 a month, wouldn't it?

A. Yes, sir.

Q. You don't mean to say that on $95.00 a month you could pay all of those expenses of operating and labor and still have $75.00 to $100.00 profit, do you?

A. No, sir.

Redirect examination.

Questions by Mr. Moody:

Q. There is not a lot of expense to operating a flowing well, is there?

A. No, sir.

Q. You just have to have a man to go open a cock and let it flow and then go back and turn it off, isn't that about all there is?

A. That is correct. The expense is the tax, gross production tax, and that small amount of labor.

(Witness Excused.)

Mr. Moody: In connection with the examination of the witness just now Mr. Hart used the term marginal well. Mr. Hart and I may have some quarrel about what a mar-
[fol. 316] ginal well means, and I wonder if it wouldn't be agreeable with Mr. Hart to clear up what he means by the term marginal as he uses it in his examination.

Mr. Hart: I mean the statutory marginal well. That is, a pumping well which is incapable of producing more than twenty barrels per day over an average for the preceding thirty days.

Mr. Moody: I am, of course, in this agreement with him as to what the statutory definition of a marginal well is.

Judge Sibley: That is the statute.

Mr. Moody: I think so, but I want to point out to your Honor—I think it is clear what he means as he uses that term. I have said so-called marginal wells. My contention is it is a well producing less, in the East Texas field, than twenty barrels, twenty barrels or less per day, which will be damaged or caused to be prematurely abandoned by the artificial curtailing of its production, or as to which an artificial reduction or curtailment of its production will lead to the loss of oil ultimately recovered from it.

Judge Sibley: That is the general definition the statute first made?

Mr. Moody: Yes, sir.

Judge McMillan: Hasn't everybody agreed that the marginal well is a small factor over there? It is less than one per cent?

Mr. Moody: I think so.

Judge McMillan: It ought not to dominate the production of that field.

[fol. 317] Mr. Moody: No. I think it will only arise if an effort is made to justify the twenty barrel minimum allowed to all wells because of the marginal statute.

Mr. Hart: I want to make it clear to the court that the marginal wells are in a separate class by themselves, a negligible number and negligible in amount of production; that the twenty barrel per day base allowable is not based on the statute, but it is based on a finding by the Commission that that is a reasonable minimum below which they cannot safely reduce those wells without causing waste and confiscation.

Judge Allred: You want to make that independently? That is not dependent on the statute at all.

Mr. Hart: No, sir, it is not dependent.

Mr. Moody: As I understand it, the Attorney General's contention is that that is to be implied from the order. I don't think there is any express statement in the order or elsewhere of anything to that effect.

Judge Sibley: The order will speak for itself.

Mr. Moody: Yes, sir.

E. O. Buck, a witness for the complainant Rowan & Nichols Oil Company, having been previously duly sworn, testified as follows:

D rect examination.

Questions by Mr. Moody:

Q. State your name, please.

A. E. O. Buck.

Q. Where do you live, Mr. Buck?

[fol. 318] A. Houston, Texas.

Q. What business are you engaged in?

A. I am a consulting petroleum engineer and geologist.

Q. State your educational training, please, that goes to form a part of your equipment as an engineer and geologist.

A. I am a graduate of Texas A. & M. College, class of 1926, with a major in geology and a minor in petroleum engineering.

Q. Since graduating from the Texas Agricultural & Mechanical College state the experience you have had or where you have had experience working as a geologist and petroleum engineer?

A. I was employed by the Gulf Petroleum Corporation in June of 1926, and was with them until June, 1931. During that time I worked in the Laredo district, North Central Texas district, West Texas and the Panhandle districts for the Gulf Company. After leaving the Gulf I went to East Texas and I was there nineteen months as resident engineer for the Texas Railroad Commission. I left there in 1933, and was employed as technical adviser for the Conroe Operators Association; stayed there in that field supervising the development until 1935. Since that time I have been in the general consulting practice in Houston, Texas.

Q. For nineteen months during 1931, 1932 and 1933, I understand you were the Railroad Commission engineer in the East Texas field?

A. That is correct.

Q. At that time was that field in the process of development?

A. Yes, sir.

Q. Since 1935, during the time you have been engaged as a consulting engineer, petroleum engineer and geologist, have your employments limited your work to any one field or [fol. 319] have your employments been in various fields in this state and other states?

A. Various fields in this state and other states.

Q. Now, have you made a study of the material that is available on the East Texas oil field?

A. Yes, sir.

Q. You have been actually in the field?

A. Yes, sir.

Q. Have you supervised some of the Railroad Commission's regulations in that field? Didn't you when you were connected with the Railroad Commission?

A. Yes, sir.

Q. Made various tests in the field?

A. Yes, sir. During 1931, 1932 and 1933 I supervised numerous tests in the field, and since that time have had occasion to evaluate and appraise numerous pieces of property there, which I have had to go back to make further investigations and tests in the field.

Q. Have you studied logs of wells, electric logs, in the field, sand cores, and made the various other studies that engineers make in an effort to inform themselves about the properties and qualities and characteristics of an oil field?

A. Yes, sir.

Q. Have you acquainted yourself with the Rowan & Nichols Todd "A" lease in the Castleberry survey in the East Texas field?

A. Yes, sir.

Q. Are you also acquainted with the Rowan & Nichols Todd "B" lease, Castleberry survey, in the East Texas oil field?

A. Yes, sir.

Q. Where are these two leases with respect to each other? [fol. 320] A. The two leases are located in the Castleberry survey, on the western side of the Castleberry survey. And

the Todd "A" lease is located some 1,150 feet north of the Todd "B" lease.

Q. The Todd "B" lease is the one involved in the prior Rowan & Nichols suit?

A. That is correct.

Q. You are acquainted with that? You testified in that suit, did you not?

A. Yes, sir.

Q. Now, Mr. Buck, have you undertaken to compile figures showing the acreage of the East Texas oil field, the acre-feet of sand in the field, the amount of oil that has been produced from the field, the amount of expected recovery from the field, the estimated amount of oil under the Rowan & Nichols Todd "A" lease, and the prospective recoveries from that lease?

A. Yes, sir, I have.

Q. In preparing or in undertaking to assemble that data or those facts, have you studied all available data bearing on the subject?

A. I have studied every bit of the data I could get hold of.

Q. Does that include what the Railroad Commission has in the way of maps and one thing and another in connection with the East Texas field?

A. Not particularly any information I was able to get from the Railroad Commission until after I had completed my survey.

Q. All right. Now, have you prepared a chart undertaking to show the results of your studies on these matters [fol. 321] that I have just asked you about?

A. Yes, sir.

Q. Is that the chart on the board over there?

A. Yes, sir, that is it.

Q. Does it truly reflect here in figures your opinion as to the facts that are purported to be represented by those figures?

A. Yes, sir.

Mr. Moody: I offer this in evidence and will prove up the various items of it.

(The above referred to chart was thereupon received in evidence and marked Complainant Rowan & Nichols Oil Company's Exhibit No. 27.).

Q. What date are these figures based on?

A. As of January 1, 1940.

Q. What do you calculate the proven acreage of the East Texas field to be?

A. 131,794 acres.

Q. What per cent of that acreage is in the Rowan & Nichols Todd "A" lease?

A. Todd "A" lease is 28.25 acres, or .0214349 per cent.

Q. What do you calculate as the total acre-feet of productive sand?

A. The total acre-feet of sand is 4,990,350.

Q. Is that net sand?

A. That is net sand.

Q. Net oil bearing sand?

A. Yes, sir.

Q. Are your figures on that entirely in accord with what you understand to be the Railroad Commission's figure on that?

A. Yes, sir. They are maybe some 30,000 feet higher.

[fol. 322] Q. Your figures are some 30,000 feet higher?

A. Yes, sir.

Q. Out of nearly 5,000,000?

A. Yes, sir.

Q. What do you calculate to be the total acre-feet of net sand under the Todd "A" lease?

A. 2,627 feet.

Q. What per cent of the total acre-feet of sand in the East Texas field is under the Rowan & Nichols lease?

A. .052642 per cent.

Q. Have you calculated the average sand thickness in the East Texas field?

A. Yes, sir.

Q. What do you figure that at?

A. 37.86 feet.

Q. Have you calculated the average sand thickness in the Rowan & Nichols lease?

A. Yes, sir, as 93 feet.

Q. How does that check with this Railroad Commission isopach map which is identified in the record as Plaintiff's Exhibit 4?

A. From the map the Commission schedule was made, and they show the sand thickness average of that lease to be 94 feet.

Q. Now, have you calculated the expected recovery per acre-foot of sand in the East Texas field?

A. Yes, sir, that is my estimation of what the average recovery will be over the life of the field.

Q. What figure is that?

A. 927.40 barrels per acre-foot.

[fol. 323] Q. In calculating that figure do you undertake to base it on just what has happened up to the present time, or project it out for the productive life of the field?

A. That is my estimation for the average recovery over the entire producing life of the field.

Q. Have you calculated from these figures the recovery expected, recoverable oil in the East Texas field?

A. Yes, sir.

Q. What figure is that? What do you figure that at?

A. 4,628,054,299 barrels.

Q. Have you calculated the expected recoverable oil originally under the Rowan & Nichols lease?

A. Yes, sir.

Q. What do you figure that at?

A. 2,434,656 barrels.

Q. Now, in what per cent of the original expected recoverable oil in the field do you estimate was under the Rowan & Nichols Todd lease?

A. .052606 per cent.

Q. How does that per cent of the recoverable oil under this Todd "A" lease compare with the per cent of acre-feet of sand under the lease?

A. That is almost the same. It is past the fourth decimal point.

Q. Now, have you calculated the production of oil from the East Texas field up to January 1, 1940?

A. Yes, sir.

Q. What do you calculate that at?

A. 1,447,821,784 barrels.

Q. In taking that figure have you undertaken to include hot oil as well as oil produced in conformity with Railroad [fol. 324] Commission orders?

A. These production figures are based on the API of production reports issued currently from month to month since the beginning of the field, and they attempted to not only count all of the allowable oil and reported oil, but it was their estimate of the excess oil that was produced in the field, so these figures based on that would include total production as near as it could be calculated.

Q. Is that, in the engineering profession and the oil business, regarded as a reliable source to secure that information from?

A. Yes, sir.

Q. Is it or not regarded as more reliable than the reports made to the Comptroller's Office for tax paying purposes?

A. I wouldn't say that in the past few years, but several years ago it was, yes, sir.

Q. Now, have you calculated the amount of oil that has been produced from the Rowan & Nichols Todd "A" lease to January 1, 1940?

A. Mr. Rowan furnished me from his office records a total production of 493,120 barrels.

Q. What per cent does the amount of oil or is the amount of oil produced from the Rowan & Nichols Todd "A" lease of the total amount of oil produced from the field?

A. .0340594 per cent.

Q. Now, then, has the Rowan & Nichols Todd "A" lease, based on that total production, been allowed to produce in relation to or in the ratio that the original expected recoverable oil under the Rowan & Nichols Todd "A" lease bore to the original expected recoverable oil under the entire field?

[fol. 325] A. No, sir, it has not.

Q. More or less?

A. Less.

Q. By what per cent?

A. Almost half.

Q. Has it been allowed to produce in the relation that the acre-feet of sand under the Rowan & Nichols lease, Todd "A" lease, bore to the total acre-feet of sand in the field?

A. No, sir, it has been producing less.

Q. Now, then, have you undertaken to estimate the remaining recoverable oil in the East Texas field?

A. Yes, sir.

Q. What do you estimate that figure at?

A. 3,180,232,515 barrels.

Q. What do you estimate to be the remaining oil under the Rowan & Nichols Todd lease?

A. 1,941,536 barrels.

Q. What relation or what proportion is the latter figure of the first?

A. That would be .0610501 per cent.

Q. Now, have you calculated the extent to which the East Texas field has been depleted?

A. Yes, sir.

Q. What do you figure that at?

A. 31.28.

Q. Have you calculated the extent to which the Rowan & Nichols Todd "A" lease has been depleted?

A. Yes, sir.

Q. What do you find that figure to be?

A. 20.25.

[fol. 326] Q. Now, then, there has been some point made here that there is as much oil in place now under this Rowan & Nichols Todd "A" lease as there was originally in place under that lease.

A. That is correct.

Q. All right, then tell the court, explain to the court, how you figure this depletion?

A. The field has been depleted thirty per cent, and during this producing period of time Rowan & Nichols has only been permitted to recover 20.25 per cent of its production. In the meantime the field has suffered this 31.28 depletion, and the water is moving in from the west and is pushing the oil forward, and it is migrating on eastward. At this time the Rowan & Nichols lease is only serving as a storage tank until such time as the oil is taken on out by the faster rate of production that the field is getting over what Rowan & Nichols is getting, although they have as much oil now as they had originally. Under the order now existing or any order in the past never could Rowan & Nichols recover this amount of oil.

Q. You mean by this amount of oil the amount of oil originally in place under their lease?

A. That is correct.

Q. Now, if Rowan & Nichols had been allowed to produce in the same ratio that the balance of the field has been allowed to produce, based on its reserves, then Rowan & Nichols would have gotten approximately a half more oil than they have gotten, is that correct?

A. Yes, sir.

Q. That would be about 200,000 barrels more oil?

A. It has lost to date under these past and present [fol. 327] schedules 269,035 barrels.

Q. In other words, if Rowan & Nichols had produced from the reserves originally under that lease in the proportion

that the balance of the field or the entire field has been allowed to produce Rowan & Nichols would have produced 200,000 barrels more?

A. 269,035 barrels.

Q. Now, then, while the amount of oil now in place under the Rowan & Nichols lease is substantially or is as much as the amount originally in place under that lease, what are the facts with respect to whether or not there is as much recoverable oil, that is, oil that Rowan & Nichols can recover, whether or not there is as much recoverable oil under the Rowan & Nichols Todd "A" lease now as there was originally under this lease?

A. Not so long as the field is produced the recoverable oil is not the same as it was originally.

Q. Now, explain to the court why, although there is as much oil in place under the Rowan & Nichols lease now as there was in place originally, explain to the court why under the present plan of proration, the system now in force, Rowan & Nichols do not have as much recoverable oil under their lease as they had originally?

A. Well, if you take the daily field production where there would be 690,000 barrels a day, or whatever the Commission elected to put as a top allowable for the field, Rowan & Nichols in producing in there would have approximately that same proportion of .037762 of the daily field allowable. It would reqnire under the present allowable for the field 4,609 days to deplete the field, and under the same 260.6 barrels production Rowan & Nichols get [fol. 328] it would require 7,750 days for it to deplete its property, so the field has been depleted 3,000 days before Rowan & Nichols pays out.

Q. On that explanation you have explained the next two figures that appear on Plaintiff's Exhibit 27, that is, the daily rate of production is 690,000 barrels and Rowan & Nichols is daily producing 260.52 barrels or .037762 per cent of the daily allowable?

A. Yes, sir.

Q. In other words, Rowan & Nichols Todd "A" is not allowed to produce that per cent of the daily field allowable that the oil in place under the Rowan & Nichols lease bears to the total oil, the total recoverable oil in the field, and it is not being allowed to produce in the ratio that the sand under the Rowan & Nichols lease bears to the total sand in the field, is that right?

A. That is correct.

Q. It is producing just a little more than half what its ratio would be?

A. You see, the field ratio over the Rowan & Nichols is in the order of 3.1 to 2.

Q. Now, then, under that rate of production the field would be depleted in 4,609 days, and it would take Rowan & Nichols 7,750 days to get its share of the oil?

A. That is correct.

Q. Figured in years, that is the next item on the exhibit, I believe.

A. On a 365 day year the East Texas field will be depleted in 12.62 years, while the Rowan & Nichols property would have to produce 21.23 years to recover the recoverable oil. Taking it on a 261 day year, or Saturday and [fol. 329] Sunday shut downs, the field would be depleted in 17.66 years, but it would require Rowan & Nichols 29.69 years to recover its pro rata share of the oil.

Q. Now, then, Mr. Buck, based on your study of the East Texas field and the Rowan & Nichols lease, assuming that the present plan of proration, that is, the plan in force under the order of January 24, 1940, is continued throughout the productive life of the field, what is your opinion as to whether the Rowan & Nichols Oil Company, within the productive life of the field, would recover from the Rowan & Nichols Todd "A" lease an amount of oil substantially equivalent to the amount of oil originally in place under that lease?

A. I might have got lost a little bit on that question, counsel.

Q. Well, I will state it over again: From the studies you have made of the Rowan & Nichols lease and the studies you have made of the East Texas field, assuming that the present plan of proration, that is, under the order of January 24, 1940, is continued in force during the productive life of the field, what is your opinion as to whether or not Rowan & Nichols would under such a plan of proration be able to produce from the Todd "A" lease in the productive life of the field an amount of oil substantially equivalent to the amount of recoverable oil originally in place under the Todd "A" lease?

A. He wouldn't produce that amount by some 900,000 barrels.

Q. In other words, in the life of the field Rowan & Nichols would lack 900,000 barrels of getting as much oil as there is in place under the lease, is that right?

A. Slightly in excess of that.

[fol. 330] Q. Of recoverable oil originally in place?

A. That is right.

Q. Slightly less than 900,000?

A. Slightly more.

Q. Slightly more than 900,000?

A. Yes, sir.

Q. And I believe oil is worth about $1.10 a barrel, isn't it?

A. East Texas crude is $1.10.

Q. Now, then, what will happen to prevent Rowan & Nichols producing, within the productive life of the field, under this present plan of proration, an amount of oil substantially equivalent to the amount of recoverable oil originally under the lease?

A. The Railroad Commission proration order.

Q. All right. Will the lease be drowned out by the water, in your opinion, before Rowan & Nichols gets its oil?

A. Yes, sir, the lease will be drowned out from water considerably before he would recover—oh, within 900,000 barrels of what his recoverable oil would be.

Judge Sibley: What year do you think, on the present rate of exhaustion, the water would drown out the Rowan & Nichols lease?

A. I hadn't calculated it on that basis, your Honor. I can make that calculation.

Judge Sibley: The thought I had in mind was that the western wells will get drowned out and then there will be fewer and fewer wells left to divide this top allowable among, and the individual wells will therefore have their production run up as that happens.

[fol. 331] A. Yes, sir, in that event, so long as there is any minimum given on the per well basis or seventy-five per cent of the allowable of the field allocated on the per well basis, the properties to the east of the Rowan & Nichols lease will be getting substantially more oil in their pro rata share than they participate in the field's reserve, and that ratio will stay a constant ratio.

Judge Sibley: My first question was whether or not you had considered what year, according to the way things are running, Rowan & Nichols really would lose their lease?

A. No, sir, I hadn't any time factor.

Q. Can you make that calculation?

A. I believe that I have enough information in Austin to do that, yes, sir.

Judge McMillan: You say this field will, on a 365 day basis, be depleted in twelve and a fraction years?

A. At the present rate of depletion.

Judge McMillan: Is that figuring the field generally as a whole or are there certain parts that will run on longer? Do you take an average?

A. That figure, Judge McMillan, is based entirely on 690,000 barrels a day rate, divided into the remaining recoverable oil reserve of the field. That means the field would have to produce the last day it produced 690,000 barrels, so that is for comparative purposes only. Unquestionably properties on the east side of that field will continue to produce twenty or thirty years after some of these other properties are drowned out.

Judge McMillan: But you think the Rowan & Nichols lease would certainly be gone, on this basis, within a period [fol. 332] of twelve years?

A. In twelve years if you maintain a 690,000 barrel top allowable, yes, sir, I believe it would.

Judge Allred: What do you mean by this 21.23 in the righthand column?

A. That means if he got all of his recoverable oil, Rowan & Nichols, he would have to produce 21.23 years, whereas the field would be depleted in 12.62 years.

Q. Mr. Buck, those two figures of 12.62 and 21.23 are comparative figures, as I understand you, based on the 690,000 barrels daily field allowable?

A. Yes, sir.

Q. All right, suppose that field allowable is reduced below 690,000 barrels daily, but the method of proration of their daily allowable among the wells remains the same, all those

figures, while they may change, they will remain in relation the one to the other the same?

A. Yes, sir.

Q. The ratio will be the same?

A. Yes, sir, so long as the allowable is 2,527 those figures will be the same.

Q. What?

A. Twenty-five per cent on formula and seventy-five per cent per well.

Q. Whether the daily allowable is 500,000 barrels a day or a million barrels a day, if it is allocated among wells on the present formula and in the ratio of seventy-five per cent on a per well basis and twenty-five per cent on this proration formula, why, the figures 12.62 and 21.23, while they will change, the figures that would go in there in their [fol. 333] place would be in proportion the same?

A. Yes, sir.

Q. In direct proportion?

A. Yes, sir.

Q. Now, is it your opinion, then, that before ever Rowan & Nichols Oil Company would be able to produce an amount of oil substantially equivalent to the recoverable oil under its lease, if this present plan of proration is continued, is it your opinion that the lease would be drowned out by the encroachment of water before they got the oil equal to their original recoverable oil under the land?

A. Yes, sir.

Q. After that happened what is your opinion as to whether or not there will be other leases in the eastern edge of the field producing oil?

A. Yes, sir.

Q. Explain to the court why that is.

A. The top of the Woodbine section varies in elevation from minus 3,140 feet down to 3,320 feet below sea level.

Q. Yes, sir.

A. The Rowan & Nichols lease is at minus 3,280.

Q. Is there some 45 to 60 feet more structure up-dip from the Rowan & Nichols lease to the eastern extremities of the field now, that area being 45 to 60 feet higher than the Rowan & Nichols lease would be, free from water when Rowan & Nichols was drowned out?

Judge Sibley: Are you figuring on the bottom or top of the sand?

A. Based on the top.

Q. The bottom of the sand to the east is also higher, is it not, than the top of the sand under the Rowan & Nichols' lease?

[fol. 334] A. That is correct; the bottom of the sand is also higher.

Q. Will you take this pencil now and mark on this plaintiff's Exhibit 3, the Rowan and Nichols' lease—on 3 or 4, one of them,—that is the top of the sand?

A. Yes, sir.

Q. Now, where is the lease with respect to the 3200 foot contour?

A. The minus 3200 foot contour falls as indicated by the pencil.

Q. All right. Now, that map is drawn to a scale of one inch to 3,000 feet. How far east of the west edge of the Rowan and Nichols' Todd A lease is that contour?

A. Slightly in excess of 3,000 feet.

Q. Where is that minus 3160 contour?

A. The —3160 contour falls as indicated by the pencil, with the exception of a small island of 3160 that lies in between there (indicating).

Q. Now, between this lease, coming up until you get to the minus 3160 foot contour, there is a thickness of sand of 40 foot higher than the top of the sand on the Rowan and Nichols Todd A lease.

A. That is correct.

Q. That 40 feet of sand is pretty good oil sand, isn't it?

A. Yes, sir.

Q. Very prolific fields are found in less than 40 feet of sand, aren't they?

A. Yes, sir.

Q. So the water will come in and push the oil further on up the structures, and those wells will be producing oil after Rowan and Nichols lease is drowned out?

A. Yes, sir.

[fol. 335] Q. Now, Mr. Buck, under open-flow conditions which part of the East Texas field would produce the most oil or have the advantage in the production of oil?

A. Unquestionably the area of thickest sand sections.

Q. That would be in the fairway, as it is called?

A. Yes, sir.

Q. To the east and the west they would be at a disadvantage under open-flow?

A. Decidedly so.

Q. Now, what is the effect of this present plan of proration with respect to what part of the field gets to produce a greater amount of oil in proportion to the recoverable oil under that part of the field?

A. It is just the contrary. The thicker the sand, the less production you get.

Q. Leases on the east side of the field and on the west side of the field in proportion to the amount of recoverable oil under them are now producing more oil than the leases in the center of the field?

A. Yes, sir.

Q. Is that the result of this present plan of proration?

A. Yes, sir.

Q. Will that condition continue as long as that plan is in force?

A. Yes, sir.

Q. Do you know what the average amount of oil, or what is the average number of barrels of oil per hundred acre-feet of sand that is produced per day over there?

A. According to my calculations on that, at the rate of 690,000 barrels per day, the production per 100-acre feet of sand would be 13.28 barrels.

Q. That is the average?

[fol. 336] A. Yes, sir.

Q. Have you calculated the number of barrels the Rowan and Nichols Todd A lease is allowed to produce per day per hundred acre-feet of sand?

A. Yes, sir; using my basis of calculations for the field total and Rowan and Nichols total, it would be 10.11 barrels per hundred acre-feet.

Q. That would be 3.17 barrels less per day per 100-acre-feet of sand?

A. Than the average of the field.

Q. Than the average of the field?

A. Yes, sir.

Q. Are the sands under the Rowan and Nichols Plot A lease better or poorer than the average of the field?

A. In my judgment those thick sand sections areas unquestionably have the best sand conditions in the field, and should be expected to recover more oil per acre feet. However, in these calculations I have treated that section the same as I have the average recovery for the field.

Q. You mean they ought to be able to produce more—the position in the sand is such that they ought to be able to produce more on account of the quality of the sand?

A. That is correct.

Q. They have more oil under them?

A. Yes.

Q. And more sand?

A. Yes.

Q. And more bottom hole pressure?

A. No; there is some pressure west of them that is higher.

Q. They have higher potentials then?

A. That is right.

[fol. 337] Q. Have you calculated about what the recoverage will be of leases over on the east side of the field east of the Rowan and Nichols tract?

A. Yes, sir.

Q. What their recoveries will be under this present plan of proration?

A. Yes, sir; I have made some calculations.

Q. What do your calculations show?

A. We found in numerous leases that in basing recoveries on Rowan and Nichols recoveries versus these densely drilled tracts in thinner sand sections that the recovery where Rowan and Nichols only get 68 per cent of its recoverable oil, that many of those leases get recovery from 250 to as high as 22000 per cent of the amount of oil that they had originally in place, of which, of course, Rowan & Nichols is contributing its 32 per cent to.

Q. Now, based on the fact that Rowan and Nichols Todd A lease is producing at the rate of only 10.11 barrels per 100-acre-feet of sand per day, while the average of the field is 13.28 barrels per 100 acre-feet of sand; based upon the further fact that your calculations show that some leases over to the east of the Rowan and Nichols lease under this present plan of proration will produce from 250 per cent to 22,000 per cent of the amount of recoverable oil originally in place under them, what is your opinion with respect to whether or not, from day to day, the application of this proration plan to the Rowan and Nichols tract is resulting in a drainage of oil from the Rowan and Nichols tract to other tracts of land?

A. Unquestionably each day that this order stays in effect [fol. 338] that condition does exist, and the Rowan and Nichols tract is being drained as the field is being depleted.

Q. Do you think that will continue as long as that plan of proration is in effect in that field?

A. Unquestionably.

Q. If this plan of proration is continued during the producing life of the field, what per cent of the recoverable oil originally in place under the Rowan and Nichols tract do you estimate that the Rowan and Nichols Oil Company will be able to recover during the life of the field?

A. His total recovery will be somewhere in the neighborhood of 61.85 per cent of the recoverable reserves originally.

Q. That is, you mean by that he will get somewhere about 61 or 62 per cent of the amount of recoverable oil that was originally in place under his land?

A. Yes, sir.

Q. And you have taken into account not only the oil that he has produced, but that which he will produce to the end of the life of the field, if this plan of proration is kept in force?

A. Yes, sir.

Q. Do you think, Mr. Buck, that as long as the Rowan and Nichols Oil Company is required to produce daily a less per cent of the daily allowable than that per cent that its recoverable reserves bears to the reserves in the field as they originally existed that Rowan and Nichols will be constantly loosing oil and will lose oil to the end of the life of this field?

A. Yes, sir.

Q. Mr. Buck, what is your opinion as to whether or not this present plan of proration is necessary to prevent waste [fol. 339] or to contribute to waste of oil in this field?

A. In my opinion it seriously contributes to it.

Q. You mean it contributes to waste?

A. Yes, sir.

Q. Explain to the Court why you think the order does contribute to waste of oil in the field.

A. In the first place, the top allowable of 690,000 barrels per day is too high for the efficient rate of production in that field, and for that reason the Commission has to shut down the field three days a week to help build this thing back up and to keep an abnormal pressure drop from occurring in the field. Each time the field is shut down that does not necessarily mean that the 690,000 barrels of daily water moving into the field ceases. That is what helps build the pressure up that is moving the oil to the east; but it is help-

ing to drown and flood leases to the west and in many ways creating physical waste in the field at that high top allowable, and it would be better for the field to be producing seven days a week at 405,000 barrels than at 690,000 barrels four days a week.

Q. In other words, this water comes in at the rate of 690,000 barrels a day, and it traps in oil, doesn't it?

A. That is correct.

Q. What about the present plan allowing these little tracts to produce such a large quantity of oil? What about the concentrated drilling or large withdrawals in production? Does that contribute to waste?

A. Each time you shut down the field you recharge those [fol. 340] boys' batteries over there and he gets a new lease on life.

Q. The Gladewater townsite, is that a densely drilled area?

A. Yes, sir.

Q. What about the New London area?

A. It is densely drilled too.

Q. Those other places over on plaintiff's exhibit there, on that isopach map, Humble's Exhibit No. 4, they show dense areas of drilling, don't they?

A. Yes, sir; you can see it on that particular map. The wells are a little larger than on the other exhibits, and where you have those clusters of wells—it is easy to follow.

Q. Looking at that map and looking at Plaintiff's Exhibit No. 5, which has the green showing the water drawn in along on the edge of the field, just opposite the densely drilled areas has the water moved in a little further than elsewhere on the map?

A. There is marked evidence of that up and down the field, where undoubtedly unratable withdrawals and heavy concentration of development has caused water fingerings to get quite a ways into the reservoir proper.

Q. Will this order allowing every well to have 20 barrels to start with and then adding to that by the application of the formula to the well, where wells are drilled to high density, as in the Gladewater Area and in the New London area and other places where the statements show that they drilled one well to one tenth of an acre in some places, will that excessive withdrawal from that area tend to bring the water higher in that particular part of the field?

A. Yes, sir.

[fol. 341] Q. Now, will that also take an unfair part of the daily allowable to those wells, so that the Rowan and Nichols tract will not get its fair share of the oil?

A. Yes, sir; so long as you are out of proportion as high as 75 barrels per 100 acre-feet of withdrawals in one section and another section being held from eight to ten barrels per 100 acre-feet, unquestionably that disproportion causes one to lose and the other to gain.

Q. Do they have densely drilled areas on the east side of the field?

A. Yes, sir.

Q. Is that shown on the isopach map over there?

A. Yes, sir.

Q. Plaintiff's Exhibit 4?

A. Yes, sir.

Q. The pressures over there are lower, are they not?

A. Yes, sir.

Q. Do you know at what pressure the gas passes out of solution in the oil in the East Texas Field?

A. Somewhere in the neighborhood of 750 pounds to the square inch.

Q. Does the fact that there is gas in solution in the oil in the East Texas Field add to the amount that can be recovered from the field as compared with what should be recovered if the gas was not in solution?

A. Oh, unquestionably.

Q. Will this order as it allows these high allowables in areas that are drilled to high density, will those withdrawals tend to reduce the pressures and let the gas pass out of solution and lead to a reduction in the amount of oil ultimately recovered from the field?

A. Pressure differentials will invariably exist between [fol. 342] areas of high withdrawals versus areas of low withdrawals, and if these pressure differentials are in the order to where the pressure will decline below 750 pounds, they will occur. Of course, the liberation of your dissolved gas means that your fluidity of oil is decreased or the viscosity of it is increased, and it requires considerably more pressure to move that oil in its viscuous state than in its fluid state. That ratio is in the neighborhood of about three to one in the early stages and gets as high as ten to one in the later final stages of the viscuous liquid.

Q. Now, then, Mr. Buck, what is your opinion with regard to whether or not orders can be adopted for the proration

of this field that will allow to the operators in the field an opportunity to produce oil in proportion to the recoverable oil under that tract, and at the same time avoid physical waste in the field?

A. It is my belief that it can be done.

Q. You have previously suggested to the Commission and in Court, methods that could be adopted to accomplish that end, have you not?

A. Yes, sir.

Q. As long as you have any character of order that allows a flat per well allowable of 20 barrels to the well, can you have an equal opportunity among producers in the field—that is an opportunity in proportion to the reserves they have under their leases, and can you, in your opinion, prevent waste?

A. I don't believe I quite understand you.

Q. As long as you have a proration scheme or formula [fol. 343] that allows every well in the field a flat 20 barrels and then adds to it a little more—perhaps three fourths on a per well basis, and one fourth on some other factor,—can you have equal takings as between operators in the field—takings, that is in proportion to what they have under their leases?

A. No, sir.

Q. In your opinion can you by that method of proration prevent waste in the field if you have your minimum allowable as high as 20 barrels?

A. No, sir; I don't believe you can.

Q. Does the fact that the field has not been uniformly drilled necessarily makes true the two answers that you have just given?

A. That is correct; plus the too many wells have been drilled in it.

Q. What area, in your opinion, will a well in the East Texas field effectively drain?

A. My belief is that drainage will be in the order of from 15 to 25, or maybe acres to a well.

Q. You mean by that part one well could effectively drain the recoverable oil from under 15 to 25 acres?

A. Yes, sir.

Q. Then is seven wells on the Rowan and Nichols tract ample to produce all of the recoverable oil under that tract—under fair system of proration?

A. Yes, sir.

Q. Now, Mr. Buck, suppose some of these little wells that are over in the water zone in the west edge of the field producing large quantities of water and small quantities of oil,—some of these so-called marginal wells that cannot make but about an average of some 10 or 11 barrels from [fol. 344] them—some 500 odd wells—suppose those wells on the west edge were close in, would that result in a loss of the oil ultimately to be recovered from the field, in your opinion?

A. I don't think so.

Q. Why not?

A. I believe in most instances the oil would be moved up structure by the water movement there bringing it on ahead and it would be produced higher up structure. However, on numerous occasions the field has been closed in and all wells shut down, and in some of those wells, they started right up again and at approximately the same amount of oil they had before they were shut in, and we did not notice any material change in their production. In those wells oil would not have been moved up structure, but when water comes there that is all there is there anyway.

Q. Isn't it a fact that the Railroad Commission in times past has been closing all the wells in the field without regard to whether they made more or less than 20 barrels of oil?

A. Yes, sir; they shut it in tight several times.

Q. They have done that several times?

A. Since 1937, yes, sir.

Q. So far as you know, it did not hurt those wells?

A. Materially helped a bunch of them.

Q. In your opinion, did it cause the loss of any oil that would ultimately have been recovered or lead to the abandonment of any of those wells?

A. No, sir. In fact, the first shut in 1931 under martial law, that helped to recover that field considerably.

[fol. 345] Q. Now, on the west side wells that are close to the water and that are producing small quantities of oil and large quantities of water, what is your opinion as to whether or not the operation of those wells contributes to waste or prevents waste?

A. My judgment, a well of that type, the recovery of oil is of far less in value than the reservoir energy that is dissipated in the moving of all the water that is necessary to get this insignificant amount of oil, and that the reservoir

is being damaged by the operation of that type of well over the value of the oil that would be recovered.

Q. Based on your experience as an engineer, do you say you have valued properties?

A. Yes, sir.

Q. Have you made studies of how much it takes to operate wells—pumping wells and flowing wells?

A. Yes, sir.

Q. Based on your study of those matters, what is your opinion as to whether a pumping well in the East Texas field can be operated on a profit at an allowable of five barrels a day?

A. That question I could not answer as a general proposition whether it could or not. I can take any specific well and tell you quickly. So many of those wells were completed with junk equipment and were poorly completed, possibly a well like that, where all of the equipment is worn out, it might have to have more than five barrels to keep it in operation; but any well properly completed can surely do it.

Q. And most of this marginal or sub-marginal wells,— [fol. 346] most of them are on the west or east side of the field?

A. They are edge wells, yes, sir.

Q. Have most of those wells been drilled long enough to be paid out now on their past production?

A. I think so.

Q. By the way, this question,—do you know whether or not the Commission is still granting permits to drill in the East Texas field?

A. It is my understanding that they still are.

Q. Does the granting of additional permits to drill in that field lead to a further complication of this problem of operation in the field?

A. Yes, sir; we have too many wells now.

Q. Could the recoverable oil in that field have been produced from 10,000 properly located wells?

A. Yes, sir.

Q. Could 15,000 wells of that field now be closed in and the balance of the wells recover the balance of the recoverable oil in the field, can it be distributed out among the owners in the field?

A. With the provision that they be hand selected.

Q. You could pick them out?

A. Yes, sir.

Mr. Hart: Do you mean that could be done without physical waste, or as a legal method?

Mr. Moody: I am asking him about the problems of handling the field.

Q. Now, Mr. Buck, after this order as now in force and applied in the East Texas field, have you undertaken to calculate whether or not there can be located in the field a line [fol. 347] of maximum recovery, east of which the recovery will be great, and west of which the recovery will be less than the oil originally in place?

A. Yes; I believe the best name for that would be a neutral line.

Q. Have you prepared such a map and drawn such a line?

A. Yes, sir.

Q. Explain how that map was prepared and how the location of that line is arrived at.

A. The East Texas field was outlined, a composite of three maps made, one on the top of the sand, and one on the bottom of the sand, and from that a sand thickness or isopach map made. From this map various cross sections from west to east similar to the ones introduced in court yesterday, made up of Schlumberger logs, were made. The cross section data was then platted to scale on graph paper, and subdivided into sections or zones of 3,000 feet. Well, under any plan of proration, whether it be straight per well basis or other basis, the production per zone can be calculated. It has been recognized since the inception of the East Texas field that the eastern part of the field gains oil and the western part of the field loses oil, so it naturally follows that somewhere between the east and west points there would be a point that neither gained nor lose. By establishing these cross sections across the field at *a* convenient intervals to obtain this neutral point, a line of zero maximum recovery can be established from north to south across the reservoir. To the west of this line all property will lose production; to the east of the line all properties [fol. 348] will gain; and it is easy to compute in areas of 1,000 feet, or 3,000 feet, or whatever the scale of the map might be, just which zones will lose and which zones will gain, and what per cent of loss or gain they will have.

Q. Have you undertaken to make such a map and place such a line on it, based upon the production of this field under the existing proration order?

A. Yes, sir.

Q. Is the map up on the board?
A. Yes, sir.
Q. What is the number of this?
A. Exhibit No. 28.

Mr. Baker: Suppose we mark that as Rowan & Nichols' Exhibit No. 28.

(Thereupon, the map referred to above was marked as Rowan & Nichols' Exhibit No. 28.)

Q. Will you point out the line?
A. This map is very similar to the isopach map prepared by the Commission, showing the lines of equal thickness of sand, and contours on that basis, plus the control points that are on the line. Some one thousand Schlumberger logs were used in compiling the map, and they are indicated on here by squares or triangles. Those Schlumberger logs were plotted in cross sections from west to east, and the red line as shown on the map cutting from the northeastern part of the field down through the center part of the field, passing west of Kilgore on down to the southern part of the field, is the neutral line of maximum recovery. All properties located to the west of that line lose oil; all properties located to the east of that line gain oil on the [fol. 349] present twenty-five seventy-five per cent basis allowable.

Judge Sibley: You are a little west of it, aren't you?
A. Yes, sir; some 3,500 feet.
Q. Now, Mr. Buck, you have made certain statements here before the Court to the effect that on this per well basis of prorating oil, that the wells to the west will inevitably lose west of the line, and to the east will gain?
A. Yes, sir.
Q. Have you prepared a device by which you can demonstrate that as if you were in a laboratory?
A. Yes, sir.
Q. Do you have that here in the court room?
A. Yes, sir.
Q. How long would it take you to make the demonstration?
A. Possibly ten minutes.

Mr. Moody: Will the Court permit us to use that character of evidence, or not?

Judge Sibley: It doesn't look like to me that it needs demonstration.

Mr. Moody: We can't see it from down here, maybe, the way the Court sees it from up there. We are prepared to make the demonstration.

Judge Sibley: It seems to me every drop of oil taken out of the pool is replaced by salt water on the west, and all of it is bound to be moving east. There is nothing else to happen.

Mr. Moody: The purpose of this device would be to show that leases on a per well system of proration—that leases [fol. 350] on the east will recover many times as much oil as was originally in place under those leases, while leases on the west will recover substantially less oil; and that that is brought about by reason of the shape of the oil-bearing sand sections. In other words, as I undertook to describe it yesterday, it is a triangle with the long side of it up and the two short sides down, but under the way that the water moves in, the leases to the east will recover substantially more.

Judge Sibley: You just can't hold this still down there until every man gets his reserve. Unless the west man goes at a terrific rate of speed, he will lose some of his, inevitably.

Mr. Moody: This demonstrates the proposition that based on per well recoveries of per well allowables, that the east side is favored and the best properties in the field are drained to the benefit substantially of the poorer properties on the east.

Judge Sibley: Well, there is no way to help that, is there, except to give the west more, or to shut the east down?

Mr. Moody: Yes, sir; there are methods of proration that will prevent waste and will allow operators in the field to recover in proportion to what they have; but it cannot be done as long as there is a 20 barrel minimum and every well is prorated first on 20 barrels.

Judge Sibley: That is evidently the snag in the stream.

Q. I will ask you this question, Mr. Buck. In your opinion, is the minimum or flat per well allowable of 20 barrels to every well in the field, before the application of [fol. 351] the balance of the present proration formula, necessary in order to prevent waste, or necessary in order to prevent the abandonment of wells, or necessary in order to prevent the loss of oil, or necessary in order to keep the wells in the field operated?

A. No, sir; I don't believe that it is.

Q. Now, then, why is it that under this plan of proration that allows every well in the field a flat allowable of 20 barrels to the well before applying the formula, that the east side is benefitted and the west side and the fairway, the most productive parts of the field, lose oil?

A. The application of the formula, of course, first, is on a straight per well, or 75 per cent of the formula is on a straight per well basis of 20 barrels. In your areas of thinner sand sections with a less amount of oil in place, they are necessarily favored to the extent of this 20 barrels to start with. Now, your 25 per cent that is applied is applied on sand thickness, pressure, potential, and acreage. Now, your east side is your most densely drilled area. So you have more wells per acre density there to receive 20 barrels to start with, although you have less reserves. As your formula is applied times the factor of bottom hole pressure and sand thickness, the west side is favored sightly on account of the pressure difference over there; but the allocation of the oil is so small, and that density of drilling greatly overcomes it to the point that your recovery per hundred acre-feet of sand per day is exceptionally higher in the east than in any other part of the field.

Q. Does this device demonstrate that as a physical fact?

A. Yes, sir.

Q. From the operation of the laws of physics?

[fol. 352] A. Yes, sir.

Q. Now, in your opinion, if the 20 barrels minimum was eliminated from the present order, and only the formula without the 20 barrel minimum applied, would the properties then be allowed to produce substantially in proportion to what they have under them, as compared with other properties in the entire field?

A. Yes, sir; I have made such calculations on that formula, and just applying it straight and in the trial runs that I have made, in applying it to various leases, in calculations of recovery per hundred acre feet of sand per day, it checks fairly close to the amount of reserve that a property might have.

Q. Would the west side produce substantially in proportion to what it has?

A. Yes, sir.

Q. And the same way with the fairway?

A. Yes, sir.

Q. And the same way with the east side?
A. Yes, sir.

Judge Sibley: It would produce equally currently, but it would still play out first.
Mr. Moody: Necessarily.
Judge McMillan: The question was asked upon the idea that it would produce in relation to what they have got.

Q. As the oil in the west played out, would it produce currently in proportion to what it had?
A. Yes, sir.
Q. Unless the Railroad Commission does something to give it an advantage, is the property in the west side of the [fol. 353] field as valuable as the property in the center or elsewhere, where the sand is thickest?
A. No, sir.

Mr. Moody: I think it is like the man who bought his property at Sixth Street and Congress Avenue; he made a better purchase than the man who bought his property down at the bridge.

Q. Now, under open flow, if you had no regulations and threw the field open and allowed all the wells in the field to produce all they could, what part of the field would be drowned out first?
A. The west side.
Q. Would the west side, under that sort of operation, recover oil in the same proportion that others recovered, as related to what they had under their tracts originally?
A. No; regulated control would give the west side more recovery in relation to what it had in place than wide open flow would.
Q. Under wide open flow, the west side would be drowned out before the west side got its oil?
A. Yes, sir.
Q. Can you do more for the west side than let it produce in proportion to the oil under that part of the field, without taking away from someone to give to someone else?
A. We have been talking about recovery here and production. We overlooked one important factor in this problem, and that is that, although we have all of the 4,990,000 acre-feet of sand in each of those, each acre-foot of sand is capable of delivering the same amount of oil each day without

creating waste. Now, the pressure would be your deter- [fol. 354] mining factor whether that sand had the ability to give it up or not; and if it was not giving it up at an efficient rate, your pressure would reflect it. The west side having the highest pressure, being closest to the water edge, could have the ability of giving up this oil at an easier rate of pressure dissipation than the east side. And in making that correction for the straight formula there, and eliminating a lot of other things—just the acre-feet of sand, pressure differential, I believe you could get almost equity there in what you had in place to what you recovered; although your daily rate of production on the west side would be higher, it would be cut out sooner.

Q. That means if the field were prorated on the basis of acre-feet of sand times bottom hole pressure, the west part of the field would have an advantage, as compared with other parts of the field, and would get more oil; but it would be substantially equitable as over the entire field; is that what you mean?

A. Yes, sir.

Q. Now, can the west side ever produce oil as long as the balance of that field produces oil under any practical system, unless oil is taken from one owner and given to another by some Railroad Commission regulation?

A. You mean recover?

Q. Can the west side be made to produce oil as long as the balance of that field, without taking from somebody and giving it to the man with the poorer situated properties on the west side?

A. No, sir; I don't know how you could prolong that over [fol. 355] the life of the field.

Q. In the natural operation of that field or the production of it, is it or not inevitable that the west side is to be the first part of the field to go off production?

A. It is inevitable.

Q. Now, if you apply this present formula, without the 20 barrel minimum, will the west side produce about in proportion as other parts of the field, their respective reserves considered?

A. Not with the straight application of this formula, but it will be better than the present.

Q. Does the 20 barrel minimum penalize the west side and also the fairway in favor of the east side?

A. Yes, sir.

Q. In other words, the 20 barrel minimum hurts the west side the same as it hurts the fairway?

A. Yes, sir.

Q. And the west side would be better off without the 20 barrel minimum than with it?

A. Yes, sir.

Q. But you recommend, instead of the 20 barrel minimum, you recommend the acre-feet of sand times the bottom hole pressure as giving the west side a better opportunity than it would enjoy under the present formula without the 20 barrels?

A. Yes, sir.

Q. And would that be better for the west side without the 20 barrels?

A. I believe it would.

Q. That form of proration?

A. Yes, sir.

Judge Sibley: I believe this would be a good place to stop. We will recess until tomorrow morning.

(Thereupon at 5 o'clock P. M. Wednesday, February 14, 1940 court recessed until 9 o'clock Thursday, February 15, 1940.)

[fol. 356] Thursday, February 15, 1940

Morning Session, 9:00 o'clock

E. O. Buck, a witness for plaintiff, resumed the witness stand, and continued his testimony, as follows:

Direct examination continued.

Questions by Mr. Moody:

Q. Mr. Buck, I don't believe that it was stated into the record yesterday. Have you identified on this Rowan & Nichols Exhibit 28 the Rowan & Nichols Todd "A" lease with the letter "A", and the Rowan & Nichols Todd "B" lease with the letter "B"?

A. Yes, sir.

Q. Mr. Buck, have the number of wells in the East Texas field that will not produce as much as 20 barrels per day increased within the last year?

A. Yes, sir; according to the Railroad Commission's schedule, that is correct.

Q. Do you know approximately what per cent the increase has been?

A. No, I don't. Last year, if I remember, there was around 425 or 450; and I think the Railroad Commission's schedule at this time is about 550 or 555 wells.

Q. That would be somewhere close to 25 per cent increase, then?

A. Yes, sir.

Q. Now, as time goes on, if this present plan of proration is continued, what is your opinion as to whether or not the number of wells that will not produce as much as 20 barrels per day will or will not increase?

[fol. 357] A. In my judgment, that type of well will increase.

Q. Now, Mr. Buck, have you prepared some calculations —yesterday mention was made of it. Mr. Buck, the paper that you hold in your hand has been marked as Rowan & Nichols Exhibit No. 29. State to the Court what that exhibit shows, please, sir.

A. This is a tabulated comparison of the well density, the allowable, and allowable per 100 feet, acre-feet per day for the East Texas field for various leases in the field, including the Rowan & Nichols Todd "A" lease, which shows the operator, and the farm or lease, the number of acres in the tract, the sand thickness, the acre-feet of sand, the daily allowable, the well density, and production in barrels per hundred acre-feet of sand per day.

Q. Does it show the Rowan & Nichols Todd "A" lease as having a daily production of 10.11 barrels per 100 acre-feet per day?

A. Yes, sir.

Mr. Hart: I want to renew the objection I made yesterday to similar evidence offered by the Humble, that these are simply isolated examples.

Judge Sibley: We will allow you to prove some, but don't take too much time on particular instances.

Q. Now, you have listed a number of leases under the name of Hamilton & Smith. Where are they?

A. In the Kilgore townsite.

Q. Is that one of the densely drilled areas of the field?

A. Yes, sir.

Q. In what portion of the field is that?

A. In the Eastern center part of the field—in the east edge and midway between north and south.

[fol. 358] Q. The production there, is it shown to be 62.62 barrels per day per 100 acre-feet of sand?

A. Yes, sir.

Q. Now, you show the R. M. Wood lease. That is the lease you spoke of here yesterday?

A. Yes, sir.

Q. That is 27.08 barrels per day per 100 acre-feet of sand?

A. Yes, sir; that is based on the Railroad Commission's schedule showing the R. M. Wood tract to contain one acre.

Q. If it were one-third of an acre, it would be considerably more than that?

A. Yes, sir.

Q. You mean one surface acre?

A. Yes, sir.

Q. Then the Pace Petroleum Company's Tripp Elder lease, where is that?

A. Over in the Kilgore townsite.

Q. That Pace Petroleum Company's Tripp Elder lease, that is calculated on how many wells?

A. Four wells.

Q. 1.4 acres with four wells?

A. Yes, sir.

Q. And the allowable is 140.9 barrels per 100 acre-feet of sand?

A. That is right.

Q. Do you know whether or not the Railroad Commission has, within the last few weeks, granted permits for two additional wells on that tract?

A. I have been so informed.

Q. You have not examined the records yourself?

[fol. 359] A. No, sir.

Mr. Hart: We object to it, then.

Mr. Moody: I withdraw it.

Q. Now, the Ambassador Oil Company's tract, where is that located?

A. In the London townsite.

Q. Is that a densely drilled area?

A. Yes, sir.

Q. What part of the field is that in?

A. In the fairway, but in the southern one-third of the field.

Q. The allowable there is 127.15 barrels per 100 acre-feet of sand?

A. That is correct.

Mr. Moody: We offer that in evidence.

(Thereupon, the paper above referred to was received in evidence and marked as Plaintiff's Exhibit No. 29.)

Q. Mr. Buck, the paper you hold in your hand has been marked Rowan & Nichols' Exhibit 30. State what that is, please, sir.

A. This table is a tabulation comparing the original reserves and the number of days required to deplete the recoverable oil that is under each of the tracts; and it assumes that Rowan & Nichols will recover 100 per cent of its recoverable oil. If it does, these other tracts, then, assuming they will produce the same length of time, because they are at least as high as, if not higher on the structure, it shows the per cent of recovery they will receive in producing the same period that this Rowan & Nichols will produce in recovering 100 per cent of its oil.

Q. Is that based on the present plan of proration existing in the field?

A. Yes, sir.

[fol. 360] Q. Are these the same tracts of land shown on Rowan & Nichols' Exhibit No. 29 that you testified about a moment ago?

A. Yes, sir.

Q. Now, on this sheet you take Rowan & Nichols Todd "A" lease as producing under this plan of proration long enough to recover 100 per cent of the recoverable oil in place under the lease?

A. Yes, sir.

Q. Then the Pace Petroleum Company Tripp Elder would recover 1,292 per cent of its oil, is that right?

A. Yes, sir.

Q. And the Ambassador London School Lot would recover 1170 per cent of its oil?

A. Yes, sir.

Q. The R. M. Wood would recover 273 per cent of its oil?

A. Yes, sir.

Q. And the Hamilton & Smith, 18,599 per cent of their oil?

A. Yes, sir.

Q. You say all these leases are as high or higher on the structure than the Rowan & Nichols tract?

A. Yes, sir; that is correct.

Q. Now, is this typical of conditions that can be picked out existing all over the field, as shown by this Rowan & Nichols Exhibit 30?

A. Yes, sir.

Q. Mr. Buck, have you made any figures on the amount of oil—we will, to illustrate the working of this order. Take that Wood tract. That has about one-third of an acre, according to the testimony here, although the Railroad Commission Company's evidence shows it to be an acre. Have you made any figures on the amount of recoverable oil orig- [fol. 361] inally in place under that lease, the production from the tract to date, the remaining reserves, and the number of days at its present allowable that it would take that tract to produce the equivalent of the recoverable oil originally in place under the tract or in the tract, and made a comparison of that lease and the operation of this order on it as compared with the plaintiff Rowan & Nichols Todd "A" lease.

A. Yes, sir.

Q. All right. Will you state those figures to the Court, please, sir, and what they show?

Mr. Hart: I don't want to repeat my objection continuously; but may it be understood that we have the same objection to all this?

Judge Sibley: Yes, sir. They are admitted only to show how this order works in extreme cases.

A. The R. M. Wood tract, calculated on one-third of an acre, has in place some 27,000 barrels of oil. The well was completed August 24, 1937, and calculating back on its daily allowable since that time, the well to January 1, 1940, produced 15,272 barrels. That would leave some 11,000 barrels—slightly in excess of 11,000 barrels to produce, and at the present rate of production of 27.1 barrels per day, it would require about 425 days to recover 100 per cent of the recoverable oil under that tract.

Q. That is under the application of the present plan of proration?

A. Yes, sir.

Q. As to the Rowan & Nichols tract, I believe you testified yesterday at the present rate of production, it would take some——

A. 7,750.

[fol. 362] Q. For it to produce its recoverable oil?

A. Yes, sir.

Q. Now, Mr. Buck, can you, by comparing the number of barrels of oil a lease has produced per surface acre with the number of barrels that another lease in the field has produced per surface acre, can you get an accurate comparison as to whether those leases are or are not being allowed to produce in relation to their position on the structure, the thickness of the sand, and the capacity of the wells on the lease to produce oil?

A. No, sir, the surface measurement would not indicate that.

Q. Explain why that fact is true.

A. Assuming two 5-acre tracts, one to be in an area of 10 feet of sand thickness would only have 500-acre-feet of oil sand under it, and another 5-acre tract in the center of the field with 100 feet of sand thickness would have 5000 acre-feet of sand.

Q. Now, then, would a variation of pressures on the two leases have anything to do with the capacity of the wells to produce or with the value of that property as an oil producing property? I am speaking of bottom hole pressure.

A. The bottom hole pressure would be indicative in that sense as to the ability of that property currently to produce its oil; but it might not reflect the reserve that was under that particular property.

Q. If you just measure production by surface acres, that does not give you any facts about bottom hole pressure or potential of wells or thickness of sands or porosity of sands or permeability of sands, and in that sense you just measure by the number of barrels production per surface acre, are you taking into account those various things in deter-[fol. 363] mining how much oil ought to be recovered from the tracts, based upon the amount each of them, respectively, have?

A. No, sir; I have not made those calculations.

Q. In view of that, suppose an operator in this field drills his tract of land to the average density of the field, or a little less than that, under the application of the formula now in force by the Railroad Commission for prorating the field,

would the fact that he has the average density, or something less than the average density of the field in drilling, measuring average density by surface acres, would that fact—the fact that he has drilled to the average, or less than the average density of the field, enable him under this order to produce oil in proportion to the reserves under his lease as compared with the reserves of the field, or allow him to produce as much oil in proportion to what he has as some of the other leases in the field might have, that were even more or less densely drilled?

A. No; you could not make that comparison. You see, that density is slightly in excess of one well to five acres.

Q. That is surface acres?

A. Yes, sir. Now, the average sand thickness of the field is around 37 or 38 feet—37.86 feet. If you take a 5-acre tract that had 100 acre-feet of sand, it would take about two and a half sand on that 5-acre tract to give you the same density as the 5-acre density of the field, in comparison of reserves.

Q. Well, then, in order to make this order operate equally among operators in that field, does that mean that each lease owner would have to drill his lease down to the density per 100 acre-feet of sand of the most densely drilled tract in the field?

A. To make it equal, that is correct.

Q. That would not be practical, would it?

[fol. 364] A. No, sir.

Q. Now, Mr. Buck, under open flow conditions, you were asked some questions yesterday about whether or not the east side would lose part of its oil in place, and you stated that under open flow conditions the east side would lose part of its oil in place, and I believe you said the west side also. The fairway would have the advantage?

A. Yes, sir.

Q. Can you give the Court any estimate as to what per cent of the recoverable oil in place under the eastern portion of the field would be lost under open flow conditions?

A. The loss there, based on one observation in the East Texas field under approximately open flow conditions and other calculations, would be in the order of 25 or 30 per cent of the recoverable oil which would be lost.

Q. Now, have you had any experience in that field under open flow conditions and the effective open flow conditions on the east side leases?

A. There was virtually open flow when I had this experience, yes, sir.

Q. Tell the Court what happened to wells on the east side under open flow conditions, and then what happened to wells after restrictions were put on them.

A. In the summer of 1931, when there were less than 1800 wells in the field, the daily production was in excess of one million barrels per day. There was one lease, the Sinclair W. W. Holland lease, that was located in the Joinerville area, which I calculate would have some 27,000 barrels of recoverable oil per acre under it. By the time, or just prior to the mar*shall* law shut down in the field on August [fol. 365] 17, 1931, this lease had ceased to flow, and they had equipped the lease with an air jammer, or were trying to lift the oil with air, or they were trying to lift the oil with air—blowing the oil out of the well with air; and there was very little production that could be obtained off the property. The production was down somewhere in the neighborhood of 17,000 barrels per day, showing a loss of 10,000 barrels a day that the property was suffering; as to the west of this property there was good oil-bearing sands and good wells capable of producing twenty or thirty thousand barrels a day.

Q. After the field was closed in and they went to producing the field under proration, what happened to those wells?

A. The field was shut in seventeen days, and after the field was opened up again, all those wells started flowing oil again. That entire lease was re-charged, along with other leases in that field. My recollection is that there were 144 pumping wells in the field that were just pumping small amounts of oil that went back as flowing wells after the mar*shall* law shutdown was lifted.

Q. Were those 144 wells on the east side?

A. Yes, sir; all on the east side.

Q. Now, Mr. Buck, I believe you stated the 20 barrel minimum will cause the east side properties—the west side properties to lose to the east side properties as long as this order is continued in force. Can you take the blackboard and a piece of chalk, and illustrate that to the Court, as to how it will work under a laboratory experiment showing equal takings clear across this field?

A. I believe that question is stated a little wrong, but I think I know what you mean.

[fol. 366] Q. Can you do it?

A. Yes, sir.

Mr. Moody: Do we have permission of the Court to use the blackboard?

Judge Sibley: Yes, sir, I reckon so.

A. If the area outlined on the board here is a cross-section of the East Texas field with the water level as indicated at minus 3320, this would represent the original conditions as they existed in the field prior to its development. As wells were drilled in the field, there was a natural water rise in the field to displace the oil. Now, if we cut this field into equal sections, and by volume compute the area of each section, and the area of the whole, and produce this field under a minimum allowable, or give to each well the same amount of oil each day, or virtually so, each of these sections will be producing the same amount of oil.

Mr. Hart: We want to object to this, because his assumption there is that each section in the field will be producing daily the same amount of oil, and the evidence shows that the allowable in the center of the field is considerably larger than the allowable on the edges.

Judge Sibley: This is an ideal situation, of course, and not supposed to be based on actual facts.

Mr. Moody: The purpose of the illustration is to show the effect of the 20 barrel minimum allowable clear across the field.

Judge Sibley: I don't think there is any need of showing it, as it just could not work but one way; but go ahead and make it brief.

Mr. Hart: Note our exception.

A. The field being successively drowned out in each sec-
[fol. 367] tion as the water intersects the top of the producing zone, will show the various producing zones as they got out, and the other ones that are producing. The other important part of the illustration is that if a constant rate of flow is maintained when the reserves are as much as 690,000 barrels of oil per day, as the base of the triangle is shortened, the water rise would naturally be much more rapid on any constant rate of flow, and although the water rise has been rather small so far, as the balance of the 50 per cent is taken from the field, the water movement will be accelerated in the triangulation ratio that we have here.

Q. Does that mean that as the man up at the east end is allowed to produce his 20 barrels, that he is replenished by oil moving from the man at the west end?

A. Yes, sir.

Q. As the well begins to be exhausted, and the water is under more of the field and has risen higher, will the rise be more rapid in the later life of the field than now, or less rapid?

A. That would depend entirely on your rate of flow. If this 690,000 barrel rate is maintained, it would be greatly accelerated.

Judge Sibley: Then all those wells in the east would have to run wide open to produce that flow?

A. Yes, sir, that is correct.

Q. If the allowable for the field of 690,000 barrels is reduced in the later life of the field, and before the Rowan & Nichols lease is drowned out, but the plan of proration is continued the same—that is, while the field allowable is reduced, the plan of distributing the field allowable among wells remains the same, say, 20 barrels per well, and then the balance above is prorated on the formula, so long as they can have enough field allowable to prorate in that way, [fol. 368] will Rowan & Nichols continue to suffer proportionately on their Todd "A" lease the injury that you have testified about yesterday?

A. Yes, sir; the ratio will be the same.

Q. Now, if the field becomes depleted and it becomes necessary to reduce the total field allowable, and that is reduced to an amount where they cannot give a flat per well allowable of 20 barrels, but the order does give a flat per well allowable and then prorates the balance above that so that 75 per cent of the daily allowable is prorated on a per well basis, and approximately 25 per cent on a basis of some factor such as is used in the present order, what will be the effect on Rowan & Nichols, assuming their properties are still producing oil; what will be the effect on Rowan & Nichols' properties with respect to whether or not that Todd "A" lease will continue to suffer the injuries that you have testified about yesterday that it is presently suffering?

A. That ratio, so long as the allowable is maintained on a 75-25 basis, the ratio of loss will be the same to Rowan & Nichols, regardless of what the top allowable might be.

Q. You mean this system of 75 per cent per well allowable and 25 per cent on some other factor will result in Rowan & Nichols' not being able to produce its share of the recoverable oil?

A. That is correct.

Q. Now, Mr. Buck, you have testified about the effect of this order on Rowan & Nichols Todd "A" lease. I believe the testimony shows that Rowan & Nichols have one other lease in this field, the Todd "B" lease. Are you familiar with that lease?

A. Yes, sir.

Q. State whether or not, in your opinion, whatever Rowan & Nichols may lose from its Todd "A" lease, it will make [fol. 369] up from production on its Todd "B" lease, or is that lease affected in about the same way by this order?

A. The two leases are practically identically located on the structure and have practically the same identical physical characteristics, so that their losses in proportion to their reserves, would be the same.

Judge Sibley: They are drilled to about the same density?

A. The Todd "B" lease has one well to five acres.

Q. The sand is not quite as thick there, is it?

A. Not quite.

Q. The pressure is not quite as high?

A. Not quite.

Q. At any rate, the Rowan & Nichols Oil Company is not making enough on its Todd "B" lease to make up for what it has lost on its Todd "A" lease?

A. No, sir.

Q. Yesterday Judge McMillan asked if some of us would show here how this formula is worked out by the Railroad Commission and how it is applied to leases. Can you do that?

A. Yes, sir. The page that I have here shows the lease, and the operator, the location of the lease, and the survey it is in, the number of acres in the tract, and the density of the tract, and the number of wells, and it has a potential factor of the well as taken from the Commission's potential map, which is multiplied by the well density acreage on the

lease. Then the sand thickness of the tract by wells is given.

Q. Pardon me. I believe I can get a page or two out of here so that the Court can see a little more clearly than they can get it from your statement of it there as to how that operates. (Counsel hands page to witness and pages [fol. 370] to the Court.) Now, we all have different pages here, but let me ask you a few questions. The right hand column over there is the number of the well, is it not?

A. Yes, sir.

Q. And then the name of the operator appears in large type, and the name of the lease in smaller type?

A. Yes, sir.

Q. Then the next column is the potential?

A. Yes, sir.

Q. And underneath the name of the operator, they have the acreage in the lease and the drilling density, I believe?

A. Yes, sir.

Q. Then the next is—what is Acrg. Pote.? What does that column mean?

A. That "Pote." would be the potential of the well. Acreage potential would be the acreage multiplied by the potential.

Q. In other words, the next column is the product of the acreage and his potential?

A. Yes, sir.

Q. How is that figure obtained—by multiplying the number of acres per well on the lease by the potential of the particular well?

A. Yes, sir.

Q. Then, the next column is marked S. T. What does that mean?

A. That is sand thickness of that well.

Q. Now, the next figure is acreage Pote. S. T. That is acreage potential sand thickness?

A. Yes, sir; one multiplied by the other.

Q. That is the product obtained by multiplying acreage potential by the sand thickness?

A. That is right.

[fol. 371] Q. Now, the next is B. H. P.

A. That would be bottom hole pressure of the well.

Q. Now, the next column is acreage potential sand thickness bottom hole pressure?

A. Yes, sir.

Q. That is obtained by multiplying acreage potential sand thickness by the bottom hole pressure?

A. Yes, sir; and then dividing by 10,000.

Q. Why do they divide by 10,000?

A. Well, by that time the product would be so big that it would be unwieldy in handling; and they had to get a total for the field as a constant, so they divided all the factors by 10,000.

Judge Sibley: That cut everybody down in the same proportion?

A. Yes, sir.

Q. Now, the next column is prorated allowable?

A. Yes, sir.

Q. How do they get that prorated allowable?

A. The sum of the total of your acreage potential sand thickness bottom hole pressure was found to be some 41 million and some odd one hundred thousand after it had been divided by 10,000. Now, the field has a proratable amount of oil to be allocated on this formula of some 176,000 barrels. The constant divided into the proratable oil gives a factor of .004325. Using that constant of .004325 times the factor that is shown on the column "acreage potential sand thickness bottom hole pressure" gives the proratable oil for that well.

Q. In other words, that factor is multiplied into the 176,000, and then you get the proratable oil?

A. Yes, sir.

[fol. 372] Q. And then you add to that the 20 barrels shown in the next to the last column?

A. Yes, sir.

Q. And in the last column "Total allowable", is that proratable allowable plus the—they put that down "Marg."—that 20 barrels; is that the abbreviation for marginal?

A. Yes, sir.

Q. Now, that fraction,—could you write that fraction on the board?

A. Yes, sir.

Q. What are the factors in the numerator and in the denominator? Do they divide the numerator by 10,000, and also divide the denominator by 10,000?

A. Yes, sir.

Q. They divide through by 10,000, the total fraction—that is, to make it simple in calculating?

A. Yes, sir.

Q. The top of the fraction would be the acreage of the lease times the sand thickness times the potential of the well times the bottom hole pressure?

A. Yes, sir.

Q. And then the denominator would be the total acreage of the field times the average sand thickness?

A. No, sir.

Q. Explain it.

A. You take your numerator of this factor and add that all together.

Judge McMillan: In other words, you add together acreage, sand thickness, potential, and bottom hole pressure?

A. Add all that together and divide that by 10,000, and divide that into the proratable oil for the field.

[fol. 373] Judge Sibley: Do you add it together or multiply it?

A. They are added.

Judge McMillan: Get up there at the blackboard and show it. It seems to be very clear, but nobody seems to understand it alike.

A. You have a well with a density of 4.37 acres, for example.

Mr. Hart: One well on 4.37 acres?

A. Yes, sir; one well on 4.37 acres. We will make it this way——

Judge Sibley: Take a simple instance.

A. I can copy it quicker off the page here. (Witness puts data on blackboard.) Now, this well is a well located on 4.37 acres, and it has a potential of 550 barrels per hour. 550 times this 4.37——

Judge McMillan: You are multiplying that instead of adding?

A. Yes, sir; this is multiplying.

Mr. Moody: What is your sand thickness there?

A. 15. That gives this third column of 2404. Now, the sand thickness is 15, so the sand thickness is multiplied by this factor (indicating).

Judge McMillan: Multiplying again?

A. Multiplying again, and that gives 36.60, and then the bottom hole pressure is 1195; so the bottom hole pressure is multiplied by that, and then it is divided by 10,000 to get a

factor of 4.31 for that well. Now, each well in the field is calculated that way. Now, this 4.31 and all of that column is added to give a total of 41, billion plus.

Judge Sibley: That is for all the wells?

A. That is all the wells in the field.

Q. Now, are they added or multiplied?

[fol. 374] A. They are added, sir. All right; now, the field is permitted to produce 172,000 barrels of proratable oil, above what is deducted for the 20 barrels.

Mr. Hart: 176,000, isn't it?

A. 176,000. Now, this figure of 41 billion plus is divided into the 176,000 to get the factor of .004235, or in that proportion, or, rather, somewhere near that.

Judge Sibley: That is for each unit?

A. That is correct, sir. Now, this fraction .004235 is then multiplied by 431 for each well, and in this instance it would be 1.83 barrels of proratable oil which would be assigned to that well.

Judge McMillan: And then 20 barrels more?

A. Plus 20 barrels, which gives a total there of 21.83.

Q. Now, you divide this figure by 10,000 also?

A. No, you see it has been divided by 10,000, because this is the addition of all these factors.

Q. Let's see if we can write that plainer over here. It will be acreage times sand thickness?

A. Yes, sir. Now, the next is potential.

Q. All right. Times potential.

A. Times sand thickness.

Q. Using S. T. for sand thickness.

A. Times bottom hole pressure.

Q. And using B. H. T. for bottom hole pressure. All right.

A. Now, all of that——

Q. That is on the lease, is it?

A. That is on the lease.

Q. Now, this is divided by 10,000, is it?

A. Yes, sir.

Q. Now, do you divide this thing you have got down here by 10,000, too?

[fol. 375] A. No, sir.

Judge Sibley: What is that "thing" down there?
Mr. Moody: Well, that is the thing that is in the field.
Judge Sibley: That is the factor?

A. You see, it has been divided by 10,000.
Q. All right. You divide this by 10,000?
A. That is correct.
Q. Well, let's see; I don't see how to do that.

Judge Sibley: Put 10,000 under that.
Q. Yes, sir; I have got to get something else under that.

(Laughter.)

Mr. Hart: If the Court please, we have got Dr. Patten here to explain this in just a few minutes, and won't have to do this figuring.
Judge Sibley: We are not going to multiply any of them. (Laughter) Everybody is pleased with that formula except——
Mr. Hart: That is what I think.
Judge Sibley: The whole case turns on putting that 25 barrels in there.

Q. Is that the formula that you have over there now on the board, as you understand it?
A. That is the formula, with the exception that the sum or the total has to be divided into the proratable oil, this 176,000 barrels, to get that constant.
Q. Oh, I see. Then you have got to divide that total acreage of the field plus potential, plus sand thickness, plus bottom hole pressure, you have got to divide that into that 176,000?
Q. All right.
[fol. 376] A. That is correct, sir.

Mr. Moody: Well, Your Honor, I hope I have made that clear to the Court. I haven't to myself.

(Laughter.)

Judge Sibley: I think I understand it, Governor.
Mr. Moody: All right. I will pass the witness.

Cross-examination.

Questions by Mr. Baker:

Q. I want to ask one question, please, Mr. Buck. I believe in——

Judge Sibley: I am speaking for myself, because I am the backward member of the staff. I am not as well acquainted with these things as the other members are.

Q. I believe yesterday in response to a question from Judge Sibley, you made an assumption of the top allowable for the field remaining constant of 691,000 barrels during the balance of the producing life of the field?

A. Yes, sir.

Q. Do you recall that?

A. Yes, sir.

Q. Now, do you think that that is practical at all?

A. No, sir.

Q. To maintain such a top allowable?

A. No, sir, it could not be.

Q. As water encroaches from the west, why, the field will shrink, will it not, gradually?

A. Yes, sir.

Q. At one stage it will be three-fourths as big, at another stage half as big, and at another, a fourth as big, until it gets down to nothing?

[fol. 377] A. That is correct.

Q. Don't you think as the field becomes smaller your top allowable will have to be decreased, proportionately, at least?

A. Yes, sir.

Q. Must that be done in order to prevent physical waste?

A. It will have to be.

Q. Then, if this formula is applied, or this plan or proration that is embodied in the order of January 24, 1940, is applied, it will have to be applied to a smaller field allowable, will it not?

A. Yes, sir.

Q. Then your—if you allow the 20 barrels per well minimum to all of the wells, it is not—would it not be assumed that your proration factor will apply to about the same proportion of the total field allowable as at present?

A. I think that it would be as the field is flooded out, your ratio on a 20 barrel minimum would stay somewhere in the order of 75 per cent per well and 25 per cent on your formula allocation.

Q. You assume that because you assume that the Railroad Commission will so adjust the top allowable from time to time as to insure efficient operation and to prevent waste?

A. Yes, sir; you see, the field, in delivering its production, is only capable of producing some 8 barrels per 100 acre-feet of sand per day, with some corrections, and as the total acre-feet of the field have been flooded out, why, as that is reduced, why, the efficient top allowable of the field will have to be reduced in accordance.

Q. Then you think the maintenance of an efficient top allowable will maintain that top allowable at such figure that [fol. 378] during the balance of the life of the field the present ratio between the amount of oil that is allotted arbitrarily 20 barrels to a well, and that which is proratable under the formula, will remain about constant?

A. Yes, sir, I think so.

Q. Or in the ratio of three-fourths and one-fourth?

A. Yes, sir.

Judge Sibley: That is because the number of wells will shrink all the time and the 20 barrels per well will go out at the same time?

A. Yes, sir.

Judge Sibley: And leave the average about the same?

A. Yes, sir.

Mr. Baker: That is all.

Mr. Saye: I would like to ask one or two questions, Your Honor, please.

Examination by Mr. Saye.

Questions by Mr. Saye:

Q. Mr. Buck, I am going to ask you a few questions about the Rowan & Nichols lease, and I am not taking that lease because we are making any attack on Rowan & Nichols, but because you are more familiar with that, and I want to talk about it with reference to the field conditions.

Mr. Moody: Just a minute, please, Mr. Saye. May it please the Court, I understand that Mr. Saye is representing Mr. Fischer, and I understood Mr. Fischer to state yesterday that he had no testimony to offer. We are not offering any testimony whatever on Mr. Fischer's case at all, either for it or against it; we are only offering it, as far [fol. 379] as I am concerned, we are only offering testimony on our own case, in which Rowan & Nichols are complainants. I would like to know whether Mr. Saye is questioning

this witness as a witness for Mr. Fischer in the Fischer case. This testimony, so far as we are concerned, is not offered for or against Mr. Fischer. He is at liberty to adopt it if he wants to or not adopt it, as he chooses.

Judge Sibley: What about the understanding of the Railroad Commission; do you regard this as in against Mr. Fischer?

Mr. Hart: Yes. As I understood the Court's ruling at first, all evidence could be used for or against a party.

Judge Sibley: Yes, that is the general understanding. All right, go ahead, then, Mr. Saye.

Mr. Moody: All right.

Q. Mr. Buck, in distance, how far is the Rowan & Nichols lease from the west side of the field?

A. I would have to measure it; I don't have the——

Q. Can't you give me approximately how far it is?

A. About 22,000 feet.

Q. About 22,000 feet?

A. Yes, sir.

Q. And how many feet wide is a cross-section of the field from east to west at that point?

A. That field is roughly, there in that area, about twelve—eleven or twelve miles wide at that point, and the Rowan & Nichols lease is about two-thirds of the distance from the west to the east; that is an estimate—22,000 feet. It is about that. I can measure that for you if you would like to have it.

Q. Well, if you can give me the approximate figure, just [fol. 380] so—we won't take up much time, if you think that is approximately it, then. If you think it is about a third of the way across the field from the east?

A. No, it is a little more than a third of the way. In looking at the map there, the exhibit there shows the location of that property, and it is not quite half, but more than a third of the distance.

Q. Well, now, at this time how far has the water encroached from the west towards that lease, and in that section?

A. Underground—on the basis of the sand in there?

Q. That is right. Where is the water table from the west to the east?

A. That would be vertically? Do you mean horizontal movement or vertical movement?

Q. Either one.

A. Either one; the vertical movement in that particular area—of course, it has not reached Rowan & Nichols' lease yet at all, but the vertical movement to the west of the Rowan & Nichols' lease practically is in the neighborhood of about 8 to 10 feet.

Q. Now, the vertical movement that you talk about, that is a movement from the bottom upward?

A. Yes, sir.

Q. And of course, that only reaches up—is forced on eastward horizontally by the fact that the vertical movement pressing against the oil, or pressing against the liquid above it causes a horizontal movement, isn't that true?

A. No, it is the slope of your Georgetown contact that makes—as the water rises vertically, it naturally progresses eastwardly because of the slope of your Georgetown beds.

Q. All right. Horizontally, how far has the water approached from the west toward the east in the rear of that lease?

[fol. 381] A. I don't know, sir. The original—I had a map in the first case that showed the original water per cent, and I have one that I think now is the location of the contact water. From those maps in there possibly it has moved eastward, maybe in the neighborhood of 700 to a thousand feet.

Q. 700 to a thousand feet from the west to the east. It was in a period of——

A. On the contact point, yes, sir.

Q. Within a period of how many years?

A. That field, of course, was discovered in 1931—or '30.

Q. At that rate how long would it be before the water would move from the west horizontally to the Rowan & Nichols lease?

A. You could not make that estimation, Mr. Saye.

Q. Well, under present operating conditions.

A. Well, under present operating conditions, it would be impossible to make that estimation.

Q. Why?

A. Because of the diagram that I drew on the blackboard a while ago, as you flood—in assuming a constant rate of 691,000 barrels a day, you accelerate the water movement, and as you approach your cone of the field, you have less area to flood at the constant rate.

Q. How do you reach your conclusions as to when the Rowan & Nichols lease will be drowned out by water if you cannot figure the movement of the water?

A. We have the top of the sand on the Rowan & Nichols lease; it is contoured there as minus 3180 feet; so, in projecting a water rise to that point and then taking the slope of the Georgetown line already underneath that lease, and the eastern part of the lease, projecting across and triangulating, because I did not have access to the cross-section, I was able to compute where the bottom [fol. 382] water would be when Rowan & Nichols would drown out, and what part of the field was remaining when Rowan & Nichols had been drowned out.

Q. Now, you will have no vertical rise—vertical water under the Rowan & Nichols lease to rise and drown out the sand until it has moved horizontally from the west to that point, will you?

A. That is correct.

Q. Then you have to calculate how long it will be before that happens—before you will know when the lease even starts to being drowned out, don't you?

A. That is correct.

Q. Well, then, you just tell me you could not figure when that would occur—how long it would take?

A. Well, you have to give me some more factors there, Mr. Saye, and I can make the calculation for you; in other words, if you want to assume that this field produces at a constant rate——

Q. I said that to start with; I said under present operating conditions.

A. All right; if you want to make that assumption, I can show you how I calculate that.

Q. Why don't you just tell me?

A. Well, I can give you the figures on that.

Q. I didn't even ask you to calculate it; I asked you to tell me how long it will be before it did that.

A. On that assumption that you have made of 691,000 barrels constant rate of flow for the field, the minus 3180 contour, you would flood with water which goes through there the Rowan & Nichols lease in 11.4 years.

Q. From top to bottom, completely flooded?

A. Yes, sir, that is 365 day years.

Q. Yes, sir. Now, I will ask you to take a property [fol. 383] located one-half way between the Rowan & Nichols

property on the west side, and state how soon it will be flooded out.

A. Well, Mr. Saye, it would take—it would take something like six more hours to make that calculation; that is what it took me last night to make this first one.

Q. You have no calculation on that?

A. No, sir, I would have to work that problem backwards from the east side to the other wells.

Q. Well, in view of the calculations on the Rowan & Nichols lease over there, couldn't you give me some approximate idea about that?

A. No, sir.

Q. None whatsoever?

A. No, sir.

Q. Well, under an order, now, that allows, we will say, Rowan & Nichols to produce 10 per cent of their reserves—the total reserves in place——

A. Daily or yearly, or which?

Q. Currently.

A. Currently—that is, each day they get 10 per cent of their reserves?

Q. Yes, sir.

Mr. Moody: That is all in ten days.

Mr. Saye: Well, that is all right. I don't care what length of time it is.

Q. But, say, we take a lease located like the Rowan & Nichols lease; I don't care particularly about that lease—and say that produces 10 per cent of its reserves. Now, if you go back half way to the west side and the lease there produces 10 per cent of its total reserves currently, and the lease lies half way between the Rowan & Nichols lease and the west side of the field is exhausted within [fol. 384] half the time that the Rowan & Nichols lease is exhausted, would that be a fair division of oil between those leases?

A. If one is—goes out of production half as quick as the other one does, I wouldn't think so.

Q. Well, isn't it a fact that a lease that is located over toward the west would go off production and be drowned out more quickly than the Rowan & Nichols lease would?

A. Oh, yes, there would be lots of properties to the west of Rowan & Nichols that would go out before it does.

Q. Well, then, it would not be a fair basis to take all the leases, regardless of the situation, and figure out a formula, and let them produce what would result in their currently—currently producing their part of the reserves, would it?

A. If you will just take it and base it entirely on the reserves as they bear to the total, a formula that sets up allowable on that basis, it would not be fair, no, sir.

Q. In other words, a formula that would allow a company to produce 14.3 per cent currently of its—of the reserve—that is, oil in place under its property, if it had property that lay over there that—in the fairway, it would not only produce the oil from under that property, but would produce a large quantity of oil that would be drained in from the west, wouldn't it?

A. That, of course, would depend entirely on the location of the property, then.

Q. Well, take the Rowan & Nichols, if you want a specific location; I was just referring to the middle of the field, as compared to the west of the field, and then if that condition would not go on as you went eastward.

A. No allocation based strictly on the reserve, as it bears [fol. 385] to the field reserves produced currently, unless you had some situation there of property location, would not be fair.

Q. Well, isn't that what you are asking for?

A. No, sir.

Q. Aren't you asking to produce currently your part of the reserves?

A. No, sir.

Q. That your reserves bear to the total reserves in the field?

A. No, sir.

Q. What are you asking for?

A. We are asking for an opportunity to recover our oil or our fair share of the oil out of that field before our property is drowned out with water, and stop contributing our oil to the properties that are lying to the east and toward the more densely drilled areas.

Q. But you do agree that any order that would permit—that would accomplish that fact, would have to take in and consider migration?

A. Yes, sir.

Q. From west to east, and make some structural corrections in favor of the west side properties, and the properties on the eastern extremity of the water line back west, before what you are asking for could be accomplished?

A. Yes, sir, and I have so insisted, Mr. Saye, since 1931, on that.

Q. Now, what about this proposition, say, we do away with the 20 barrels minimum on wells, and you place all the wells on a basis of their capacity to produce, what would be the result there with reference to physical waste?

A. You mean to just open the field up?

[fol. 386] Q. No, no. If you gave each well its allowable based on its capacity to produce.

A. You mean on the Commission's potential?

Q. On the actual potential of the well.

A. On the actual potential of the well?

Q. Whatever it might be, the capacity to produce, assuming that those factors would be applicable——

A. You have got to assume further that the top allowable would be such as physical waste would not be created in the field? You make that further assumption?

Q. Well, you can do that if you want to.

A. Well, it completely changes the problem, Mr. Saye.

Q. Well, all right; take that assumption, and then tell me what it is.

A. All right. Now, we assume—if this is not the right assumption—I don't know whether I am following you or not; if we assume first, that the field is drilled just the way it is now, and that it is producing on a 400,000 barrels a day allowable, seven days a week; and that was based on actual potentials with the present well density that is in effect over there now, and the drilling pattern of the field, there could be no possible way in the world you could get equity in there.

Q. The only reason for that is because you would get too much oil?

A. Sir?

Q. The only reason for that is because you would get too much oil?

A. No, sir; it would be the distribution of your production.

[fol. 387] Q. Well, if there was no proration in effect over there at all, each well could produce its capacity——

A. Now, you say——

Q. Now, if you wanted to put into effect a proration order that would not disturb anything—any method of producing, not disturb any rule of property that has stood there, and you just curtailed each well according to its capacity to produce, your order would not operate any more discriminately than the operation of the field without the order, would it; you would treat every man equally; you would just go in there and curtail his oil according to the capacity of his well?

A. No, sir, that would not follow at all.

Q. You don't think, then, that if you owned a 10,000 barrel well there in the field and Mr. Jones owned a 5,000 barrel well, and the Railroad Commission came along and says it is going to be necessary to curtail them enough in order to prevent physical waste. Well, if the Commission cuts your well to 5,000 barrels, and cuts Mr. Jones to 2,500, you say that would not be fair, and the Commission would change the status of the thing so as to keep you from getting your part of the oil?

A. No, sir.

Q. As a matter of fact, while you—the Commission would just curtail each one of you equally and leave the status as it was?

A. That would not work at all, Mr. Saye. It does not bear any relationship between curtailed withdrawals and open flow; they are not related in any wise.

Q. Well, I won't argue that with you. Do you know of any field in Texas that was operated under open flow conditions, whereby there was uniform density—drilling density.

A. No, sir.

[fol. 388] Q. You don't know of any field in the Woodbine sand when the property was operated under open flow, that there was a uniform drilling pattern that was followed?

A. No, sir.

Q. These irregularities in the spacing of wells in East Texas is just comparable to the other fields—there was no uniform drilling in any of the fields at that time, was there?

A. As far as I know, I have never seen one.

Q. Mr. Buck, do you recall the time when you testified in the Peoples case down at Houston?

A. Yes, sir, very well.

Q. You were employed by the Railroad Commission then, weren't you?

A. Yes, sir.

Q. The orders that were being attacked in that case were straight per well orders, were they not?

A. No, sir, there was one that was a straight per well order, and the other was 90 per cent per well and 10 per cent bottom hole pressure, if I remember correctly.

Q. That was in 1932?

A. In 1932.

Q. You had not gotten to the bottom hole pressure proposition in 1932, had you? Didn't that come on after these first two——

A. No, sir.

Q. Didn't you testify in that suit that you considered the straight per well allowable for East Texas, in view of the size of the field and the conditions which existed over there, the most just and equitable order that could be put into effect in that field?

A. No, sir.

Q. You did not testify to that?

[fol. 389] A. No, sir.

Q. Didn't you testify in that case that you considered that under a straight per well allowable of curtailment, that each man in the field would recover more oil out of his well than he would without the orders?

A. Yes, sir.

Q. That each individual would?

A. Yes, sir, I so testified to that.

Q. You admit that you testified that even a straight per well allowable would do no injury to a man that was—as compared with open flow?

A. No, sir, you are a little confused about that, Mr. Saye. I will tell you the conditions over there and why that testimony. The field had been opened and producing in excess of a million barrels a day, and it finally—the Railroad Commission came in there in September, '32 or '31 and had a top allowable on that field of somewhere around 325,000 barrels a day, and I testified at that time that a per well allowable with the top held at 325,000 barrels a day would give everybody more oil over there, and would be more evenly distributed than if you let that field cock back at a

million and a half barrels a day, the way it was being produced.

Q. Yes; and didn't you testify that it was impracticable to put into effect any kind of a proration order over there except a flat per well allowable, Mr. Buck?

A. Mr. Saye, I spent right at nineteen months trying to get the Railroad Commission to write an acreage order of proration in the East Texas oil field—right at nineteen months, attempting to do that very thing.

Q. Did you testify in that case anything that you thought—anything about that you thought acreage should be considered in proration?

[fol. 390] A. I don't remember whether I did in that particular case, or not, but I have testified in practically every case that the Railroad Commission ever had, that they should take in acreage and bottom hole pressure and sand thickness, and I attempted for nineteen months to get the Railroad Commission to do it.

Q. Now, Mr. Buck, can you just briefly tell me how the marginal wells are located in East Texas, and by that I mean this, are the marginal wells situated out to themselves, or is it very often the case that the marginal well is offset by a well that will produce in excess of what the marginal well produces?

Mr. Moody: Mr. Saye, may I try to keep that plan safe in the record. When you talk about marginal wells, you mean wells producing less than 20 barrels?

Mr. Saye: Yes, sir, I am talking about the one defined by the statute, in East Texas it is a well incapable of producing in excess of 20 barrels.

Mr. Moody: Well, that is what you are talking about?

Mr. Saye: That is what I am talking about.

Mr. Moody: All right.

A. You have in most instances such as that, Mr. Saye, one a well which is not capable of producing 20 barrels a day on the pump for the consecutive thirty days, you have some wells that are in isolated areas and some which are surrounded by wells capable of producing more than that.

Q. In other words, in many instances over there you will have a well that cannot produce 20 barrels per day, but surrounding that well you will have—offsetting it, you will have wells that will produce above 20 barrels per day?

A. Yes, sir, that condition prevails over there.

Q. And you have pumping wells that will do that surrounding those marginal wells?

[fol. 391] A. It was my understanding that we were talking about pumping wells.

Q. Well, in some instances, of course, you have flowing wells—offsetting wells that are low enough on the pump to be marginal wells?

A. I don't know of any; there possibly is that condition, of course, but I don't know of that condition.

Q. But the marginal wells are in no sense set off to themselves as a class anywhere in the field, are they?

A. I think if you arranged the field according to sand thickness or according to contours, that you could put them all in the same classification and in the same area.

Q. Well, I mean as to their location in the field.

A. Oh, they are scattered all up and down the east side, and they are scattered all up and down the west side.

Q. And in many instances, in close proximity to other wells?

A. Yes, sir, most of the time.

Mr. Saye: That is all.

Judge Allred: Mr. Buck, let me ask you, if the East Texas field is so well defined and developed that you can estimate how much oil there is in place under any surface area, and how much the sand thickness is, and how much the porosity is, and so on, and how much recoverable oil there is, why is it that you have here and there those wells that are not capable of making 20 barrels a day, whether on the pump or not, which you testify are surrounded by wells that are flowing wells and are capable of producing much more?

A. In many instances, Judge Allred, those wells were completed with 3-inch casing; in fact, it was poor second-hand equipment; they were junk wells, to start with, and they were able to just get a few barrels out of them, with-[fol. 392] out going to some additional expense of equipping them. Now, to put them on a producing basis, maybe the offset wells and the reserves there would not warrant that amount of expenditure, and it is a salvage proposition in many instances; in other instances in the field we had—particularly on the east side—a sand over there that I terms a robber sand. It had no oil in it at the beginning, but when we drilled through the oil producing sand into this

lower sand, it acted as a blotter and soaked the oil out of the main reservoir, and retained it in this robber sand. Now, wells in later years completed in that never have been prolific producers; it is just a salvage proposition, and they never will recover over 10 or 15 per cent of the amount of that robber oil with which it has been saturated. Now, those wells will cut off in two or three days. Now, it could be that it is possible that immediately west of that well there could be a well drilled into the Woodbine section, and it would be a good well, while this well drilled into that trashy robber sand would not produce over two or three barrels a day; the sand just won't give it up.

Judge Allred: All right.
Mr. Baker: May I ask him another question?
Mr. Hart: All right.

Examination by Mr. Baker.

Questions by Mr. Baker:

Q. I want to get clearly what your idea is about the use of the reserves as—in fixing the allowable or in allocating the allowable between properties. Now, I believe that you said that the reserves—comparative reserves ought to be considered?

A. Yes, sir.

[fol. 393] Q. Now, you said that you thought an adjustment ought to be made for position on structure?

A. Yes, sir.

Q. Now, did you mean by that that because of the time element, that adjustment ought to be made in favor of those wells on the west side and in the fairway, because the oil is drifting up-structure to the east edge of the field?

A. That possibly could be done, in consideration of the time element, Mr. Baker. However, the problem and the formula, as applied, I think it would be simplified by considering the time element.

Q. Well, isn't it true under the existing order that more weight for sand thickness and more weight for bottom hole pressure are added in favor of the west side operators?

A. More weight for——

Q. Sand thickness and bottom hole pressure.

A. In the present order?

Q. Yes, sir.

A. No, sir, that is not true.

Q. Well, they assign an arbitrary 10 acres of sand thickness to the west side, do they not?

A. Yes, sir.

Mr. Moody: 10 feet.

Q. 10 feet?

A. Yes, sir.

Q. Now, they take the actual pressures that exist on the west side, do they not?

A. Yes, sir.

Q. Aren't those pressures higher on the west side, generally speaking, than on the east side?

A. Yes, sir, but that 20 barrel minimum weights out [fol. 394] anything you have over there. Now, if you take your formula there, 695,000 barrels, and apply that straight to the field over there, then the west side would be very much favored over its present position because of that additional sand thickness that it is being given credit for.

Q. Well, I believe you misunderstood my question, then; but I was assuming a situation in which the 20 barrel minimum or any per well minimum would be disregarded altogether.

A. Oh, well.

Q. And the proration factor used to distribute the 176,000 barrels would be applied to all of the allowable?

A. That is correct, yes, sir.

Q. Now, under those conditions, do you or not think the present formula, if the 20 barrel minimum or any per well minimum were forgotten altogether, would work out fairly well?

A. It possible would need some additional adjustment there, but it would be very close to it, yes, sir.

Q. Well, how could you make an adjustment that would take care of the disadvantage that the wells on the west side, say, and in the fairway suffer as compared with the east side?

A. Well, there are possibly several ways. I don't want to be in the position of recommending a proration order, but in the formula, taking the magnitude of diversity of pressures, say, for instance, there on the formula, by that the west side is given an advantage over the east side from this formula. If a basic contribution to pressures were made, it would come more closely to approaching the proposition there of

the west side property recovering its share of the oil. Now, that could be done in various ways. By the removal of the fictitious potential from the formula, and applying a straight sand thickness, and the pressure correction could more nearly approach that point.

[fol. 395] Q. Then you think by the application of these factors to all of the allowables in reasonable relation to each other, it would be possible for the Commission to write a reasonable order?

A. Yes, sir, I have taken the present allowable, without the 20 barrel minimum, so that I might get a bearing on what would happen, and although the Rowan & Nichols properties there are located in the fairway section of the field, and have a reserve of .0605 per cent, the 690,000 barrel allowable with a five barrel minimum will come pretty close to give a production rate equivalent to the reserves of Rowan & Nichols to the field total. However, properties to the west would fall about 30 per cent short of their reserve percentages. Now, taking a 400,000 barrel allowable, straight, without any minimum, we would get .06836, which put us slightly above, but by making a little pressure correction in there, that adjustment could be made to where I think it would pretty nearly approach most of the conditions as they exist over there.

Q. You mean it would give ultimately to all of us, to each operator, approximately a fair opportunity to recover the oil he had in place?

A. With the exception, of course, of your western one-third of the field. Now, the condition is that in one situation they would possible lose fifty per cent of the oil, and in another situation, why, that could be reduced to maybe fifteen or twenty per cent; but they are always going to lose oil so long as that field is produced.

Q. That is just a disadvantage it naturally has?

A. Yes, sir.

Q. Which cannot be overcome.

[fol. 396] Mr. Baker: I believe that is all.

Judge Sibley: We will rest for five minutes at this time.

(Thereupon, at 10:30 o'clock A. M. a recess was taken until 10:45 o'clock A. M.)

Judge Sibley: All right, Mr. Hart.

Cross-examination.

Questions by Mr. Hart:

Q. Mr. Buck, Governor Moody had you to go through some calculations here for the purpose of showing how the Railroad Commission actually arrived at the allowable of any well in the field, in applying that formula, and you didn't mean to leave any impression with the Court, did you, that the Railroad Commission doesn't actually follow the formula in allocating the allowable to wells in the field?

A. No, sir, the application of it as to 25 per cent of the allowable oil, it is correctly worked with that formula.

Q. In other words, the employees of the Commission have been able to apply certain mathematical short-cuts to reach the same result, but the result is the same as if they went through the long process on each well of multiplying the acreage times the sand thickness, times bottom hole pressure, and so on for that well, and by multiplying those same factors for the whole field, and then for the proratable oil?

A. They had to do that first. I was in East Texas when that original calculation took place. There were over 150,000 individual calculations had to be made, but after you once get the constant, it is quite simple.

Mr. Moody: I believe we have got the thing written [fol. 397] on the board now, the correct formula, at the present time.

By Mr. Hart:

Q. The only point I want to make is the Commission actually applies the formula promulgated, and they have now arrived at certain factors that save time for them in computing the allowable for any well in the field?

A. That is correct.

Q. Now, Mr. Buck, you have testified on behalf of the Rowan & Nichols Oil Company in the trial which took place in this court about a year ago, didn't you?

A. Yes, sir.

Q. Do you recall a certain paper introduced as Plaintiff's Exhibit No. 2 showing certain estimates of recoverable oil in the field, and recoverable oil under the Rowan & Nichols Todd "B" lease, and certain other calculations?

A. Yes, sir, I think I have a copy of it. I don't have the exhibit number, but I am sure I have a copy.

Q. All right. Refer to that exhibit number, please, sir, and state to the Court what was the estimate given in Plaintiff's Exhibit No. 2 before as to the total number of recoverable barrels of oil in the East Texas field in that exhibit.

A. If I have the same exhibit here, it shows 3,522,710,352 barrels.

Q. In that Plaintiff's Exhibit No. 27, which was introduced yesterday, the figure that you gave for the recoverable oil in the whole field is 4,628,054,299 barrels; is that correct?

A. Yes, sir.

Q. What percentage increase of the estimate which you gave a year ago in this Exhibit No. 2 is shown by the estimate which you gave yesterday? What percentage of increase is that in the amount of recoverable oil in the sand?

[fol. 398] A. It is about 113 per cent.

Q. How much?

A. Around 113 per cent. I believe that is correct.

Mr. Moody: Did you ask for the per cent of increase?

Mr. Hart: I asked for the percentage of the increase.

Q. You are going to let it stand at that, Mr. Buck? I want to be fair to you.

A. Whatever the percentage is there. It was raised from—right at a billion barrels.

Judge Allred: Your estimate has been raised in a year's time?

A. Yes, sir, one billion barrels.

Judge Allred: All right.

Mr. Hart: And you estimate that at being 113 per cent?

Judge Sibley: It isn't that, of course. He misunderstood you.

Mr. Hart: All right, sir. Now——

Judge McMillan: Let's get that straightened out.

Judge Sibley: We can figure it.

By Mr. Hart:

Q. Well, what is the percentage of increase? You have stated it was 113 per cent. It is actually not that much, is it? I want to be fair to you, and let you get that straight.

Judge Sibley: The increase was a billion over three billion; it will be 33⅓ per cent. Those are not the exact figures.

By Mr. Hart:

Q. Within a year's time, the estimate has increased that much?

A. From those figures, Chart No. 27 shows revised origi-
[fol. 399] nal expected recovery of oil for the East Texas field.

Q. All right, sir. On Plaintiff's Exhibit No. 2, which was introduced a year a[illegible]u have a figure for the production of the field to that date of 1,304,730,000 barrels?

A. Yes, sir.

Q. The figure which you gave of production to January 1, 1940, is simply that same figure that you gave a year ago, plus the production during the intervening period; is that correct?

A. No, sir, that isn't quite correct.

Q. Have you varied that figure too?

A. The first figure given January 1, 1939, of 1,304,703,000 barrels wasn't based on the same accumulated figures that I used in this one. There were some figures that we had then from A. P. I. figure combinations for that they deducted the amount of oil that was estimated to be produced in excess of the allowable. This time I put *it* all in that I could find.

Q. Well, how much hot oil did you add to your former figure in order to arrive at this figure you gave us yesterday of the production to January 1, 1940?

A. I couldn't give you that figure, Mr. Hart, because the other figures that I used for this 1,447,000,000 figure was taken from the A. P. I. figures that included that in there, and how much it is, I don't know.

Q. Is this figure you gave to January 1, 1939, in the trial a year ago, is that only allowable oil up to January 1, 1939?

A. As near as I could determine, yes, sir.

Q. And you don't know how much hot oil you added to that in order to reach your figure of production to date that you have there on the board of 1,447,821,384 barrels?

[fol. 400] A. No, sir, I don't.

Q. Well, on this exhibit—before I ask that question, do you have, Mr. Buck, the amount of oil, allowable oil that has

been produced between January 1, 1939, and January 1, 1940?

A. No, I don't have that figure with me.

Q. Well, I don't necessarily care to have an exact figure. Could you tell us about how much that has been?

A. No, sir, I couldn't.

Q. All right, sir. Well, in this Exhibit No. 2 which you used a year ago in the Rowan & Nichols case, you had an estimate there of the barrels of recoverable oil in the whole field of 2,217,980,352 barrels; that is correct, isn't it?

A. Yes, sir.

Q. Now, on this chart that was introduced yesterday, Plaintiff's Exhibit No. 27, you have an estimate of the remaining recoverable oil in the field of 3,180,232,515 barrels; is that correct?

A. Yes, sir.

Q. Now, in order to compare the estimate that you made a year ago with the estimate that you have made today, you would have to deduct from your estimate of a year ago the amount of oil which has been produced during the year's time, would you not, in order to make a comparison of the two?

A. No, sir, you couldn't make that comparison because all of the figures have been revised as of January 1, 1940.

Q. I understand, but you couldn't compare any estimate of the amount of oil a year ago with the—of the balance of recoverable oil a year ago with the balance of the recoverable oil today without taking into account the amount of oil produced in the meantime, could you?

A. No, sir.

[fol. 401] Q. If you took that into account, your figure of 2,217,000,000 and so on, barrels of recoverable oil a year ago, would be reduced, would it not?

A. Yes, sir.

Q. To refresh your memory, isn't it true that there has been a production during the last year of allowable oil in the neighborhood of 140 million barrels; is that about correct or not?

A. It would be somewhere in that neighborhood, yes, sir.

Q. If we deducted from your estimate of a year ago of the balance of the recoverable oil in the field, what has been produced since then, you would have a figure of a little over 2 billion barrels, wouldn't you?

A. Yes, sir.

Q. Something less than 2,100,000,000 barrels?
A. Yes, sir.

Mr. Moody: No, you would have 2,100,000,000.
Mr. Hart: Didn't I say two billion?
Mr. Moody: No; you said one billion.
Mr. Hart: It is 2,100,000,000.

A. I thought that is what you said.

Mr. Hart: I think that is what I said. That is what I meant to say.

Q. What is the percentage of increase during the year's time in the estimate of the amount of recoverable oil remaining in the reservoir in the whole field, the percentage of increase of your estimate now over what it was a year ago?
A. You mean the remaining matter of 3,180,000,000?
Q. Yes, sir, about two billion?
A. Yes, sir.
Q. That would be about a 50 per cent increase in a year's time?
A. Yes, sir.
[fol. 402] Q. Now, on this Exhibit No. 2, there are certain other estimates I want to ask you about. I believe you said in response to questions that Governor Moody asked you, that the Rowan & Nichols Todd "B" lease is located generally in the same section of the field as the Todd "A" lease?
A. Yes, sir.
Q. In fact, they are only a few hundred feet apart; isn't that correct?
A. Yes, sir.
Q. Is the sand underneath the two leases substantially the same?
A. Substantially the same, slightly less on the "B" lease than on the "A".
Q. Are the other characteristics of sand about the same on the two leases; that is, porosity and permeability and the amount of connate water? Are they about the same?
A. Yes, sir.
Q. Bottom hole pressure about the same on the two leases?
A. Yes, sir.

Q. Position on the structure substantially the same?

A. Yes, sir.

Q. What do you estimate to be the net effective sand under the Rowan & Nichols Todd "A" lease under your estimate you gave yesterday?

A. 93 feet.

Q. Under your exhibit which you introduced a year ago, the estimate you gave of the net sand under the Rowan & Nichols Todd "B" lease was only 65 feet of sand; isn't that correct?

A. Yes, sir, according to that exhibit, that is correct.

Q. Well, about what percentage increase, assuming the leases are substantially the same, about what percentage increase in your estimate of net sand has there been since a year ago?

A. About 30 per cent.

[fol. 403] Q. About 30 per cent. Now, yesterday you estimated the average net sand thickness in the field is about 37.86 feet; is that correct?

A. Yes, sir.

Q. A year ago what was your estimate of the average net sand thickness for the field?

A. 28½ feet.

Q. All right, sir. How much have you increased the estimate over a year ago?

A. Right in that same proportion of 30 per cent.

Q. In that same proportion of 30 per cent?

A. Yes, sir.

Q. All right. There hasn't been any actual change in the net effective sand under the Rowan & Nichols Todd lease or the Rowan & Nichols Todd "A" lease?

A. No, sir, a change in our information, not in the physical facts of the lease.

Q. The change has been in your information over a year's time such as to cause you to vary your estimate over a year's time of 30 per cent; is that correct?

A. Yes, sir.

Q. Now, Mr. Buck, you made certain estimates on that chart about the number of years it would take to produce the oil in the field, and the number of years it would take to produce the recoverable oil under the Rowan & Nichols tract?

A. Yes, sir.

Q. First of all, I want to ask you about those figures up there about percentage in depletion. That figure of 31.28 per cent, depletion in the whole field, represents, does it not, that there is actually that much less oil underneath the field now than there was originally; isn't that correct?

A. Recoverable oil?

[fol. 404] Q. Yes; that much less recoverable oil under the field now than there was originally?

A. Yes, sir.

Q. There are—is that the figure of 31.28 per cent, in your judgment, your opinion, substantially the same percentage as the percentage of depletion in the number of acre-feet of net effective oil sand up to the present date?

A. Yes, sir.

Q. All right. Then, you have got there right opposite that figure of depletion a per cent on Rowan & Nichols lease?

A. Yes, sir.

Q. Has there been any depletion in net effective oil sand under the Rowan & Nichols Todd "A" lease up to the present time?

A. In saturated oil sand?

Q. In net effective saturated oil sand.

A. No, sir.

Q. There is the same amount of net effective saturated oil sand under the Rowan & Nichols lease today as there has always been?

A. That is correct, or substantially that.

Q. If you take the recoverable oil that is in place underneath the Rowan & Nichols Todd "A" lease today, that amount of recoverable oil is the same, substantially, as the amount of recoverable oil which was in place beneath that lease originally; isn't that correct?

A. If the field is shut in, yes; if the field is produced, no, sir.

Q. You said there is the same net effective oil sand under it as there has always been.

A. Yes, sir.

[fol. 405] Q. And that net effective oil sand is saturated wholly with oil and not at all with water at this time; isn't that correct?

A. Except with connate water.

Q. And the connate water is the same as it always was?

A. Yes, sir.

Q. There isn't any gas formed under the Rowan & Nichols lease?

A. Not that I know of.

Q. The Rowan & Nichols lease hasn't actually been depleted of the amount of oil underneath it in the same way that the field has been depleted 31 per cent; is that correct?

A. In oil in place, no; in recoverable oil, yes.

Q. When you speak of recoverable oil, do you mean the recoverable oil underneath the lease?

A. No; what the lease is going to get.

Q. When you have been speaking of recoverable oil, you included oil that will be drained to the lease from other leases to the west, didn't you?

Q. And drained out from under the lease, or passing under that lease. It balances out.

Q. Your statements of recoverable oil, then, have not been based on recoverable oil in place beneath the tract, but on how much one lease might be able to drain somebody else?

A. No. There are two different things we are talking about, Mr. Hart. If the field is shut in and not produced at all, the Todd "A" lease, of course, would have just as much oil under it now as it ever had in place, but because the field has been depleted 30 per cent, and because the field is going to be produced in the future, the Todd "A" lease, although it has only recovered 20 per cent of its expected recoverable oil, it, too, has been depleted 30 per cent. It would be that much short of getting its recoverable oil at this time. That is the position of the oil in the field at this [fol. 406] time, and that will be aggravated as the field continues to produce.

Q. This 20 per cent is simply a calculation of the percentage of your estimate of the recoverable oil originally in place that has been produced to date from that lease; that is all it is, isn't it?

A. Yes, sir, that is correct.

Q. And then, it has no relation to any actual physical depletion in the number of acre-feet or in the amount of oil underneath the lease?

A. No, it doesn't relate to those two things at all.

Q. If you applied the same method of depletion that you have applied to the Rowan & Nichols lease on that chart there, you could figure out that almost any lease on the east

side of the field there could be depleted, although it still had the same amount of oil under it that it originally had, because it had produced part of its oil?

A. Some of those leases have been depleted 200 per cent and have still got as much oil as they ever had.

Q. According to your way of figuring, there are some leases over there that have been depleted 200 per cent?

A. Yes, sir.

Q. I didn't know you could deplete anything more than a hundred per cent.

A. Some of it has been depleted 200 per cent, and still has as much oil as it had originally.

Q. According to your way of figuring, a man can be depleted 200 per cent, and still have as much oil in place as he ever had under his lease?

A. In some properties. You couldn't do that in Rowan & Nichols properties.

Q. Now, you made, as I say, certain calculations of how [fol. 407] long it would take Rowan & Nichols to produce your estimate of their recoverable oil, and how long it would take the field to produce your estimate of the recoverable oil now remaining in the field, on the assumption that the field would continue to produce at the same top allowable?

A. Yes, sir.

Q. Is that correct?

A. Yes, sir, that is correct.

Q. All right. Let's continue that assumption. If the field is produced at 691,000 barrels a day, say, disregarding shutdowns for the time being, there will be certain portions of the field that will be drowned out by water, will there not?

A. Yes, sir.

Q. And, as I believe Judge Sibley pointed out, there will be fewer wells to divide up the top allowable by, won't there?

A. That will be correct.

Q. Well, if you keep, then, the 691,000 top allowable, and you keep the 20 barrel minimum or base allowable, the percentage of the proratable oil will be constantly going up because of the fact that you have fewer wells to take the 20 barrel base or minimum allowable; isn't that true?

A. On that assumption, that would be correct, yes, sir.

Q. On that assumption, that would be correct. You were not making an assumption that the Commission would keep

a 20 barrel base or minimum allowable from now on when you made these figures, were you?

A. Yes, sir.

Q. You were?

A. Yes, sir.

Q. I will ask you if you were not making a different as- [fol. 408] sumption, and that is that the Commission would keep a 75 per cent per well allowable and 25 per cent proratable oil allowable?

A. Yes, sir, that will work out the same, Mr. Hart.

Q. Let's see if they do. You say that if the field is produced——

A. I beg your pardon. I understand now. If you maintain this 690,000 straight through, that wouldn't be true.

Q. That wouldn't be true, would it?

A. No, sir, that is right.

Q. You based your calculations for the length of time it would take the field to produce the oil on the assumption, and you based your calculations of what Rowan & Nichols—how long it would take Rowan & Nichols to produce on a different assumption, didn't you?

A. No, sir.

Q. Let's see how it works out, now. You say if the field continues to produce at 691,000 barrels total allowable per day——

A. Yes, sir.

Q. —that part of the field to the west of Rowan & Nichols will be depleted?

A. Yes, sir.

Q. Will be drowned out by water?

A. Yes, sir.

Q. That will mean that a good many wells on the west will have to be abandoned, won't it?

A. Yes, sir.

Q. That will mean that there will be fewer wells to divide up the—to get the 20 barrels base allowable; isn't that true?

A. Yes, sir.

Q. That will mean that there will be a bigger percentage of the total allowable which will be allocated on the—which [fol. 409] will be proratable oil, rather than oil allocated on the ground of the base or minimum allowable?

A. If the allowable is maintained at 690, that is correct.

Q. That is what you assumed in these figures, wasn't it?

A. Yes, sir.

Q. Then, if the percentage of the per well allowable, as against the proratable oil allowable, will not continue at 25-75, if they keep a 20 barrel base or minimum allowable, then the amount of proratable oil will constantly increase, won't it?

A. Yes, sir.

Q. By your calculations of how long it would take Rowan & Nichols to produce their oil and based on the assumption, and in reply to what you said to Governor Moody, that the Commission would continue to prorate the field on a 75 per cent per well and 25 per cent per well proratable allowable?

A. Yes, that is correct.

Q. And that is the way it would work out if the Commission kept the 691,000 top allowable and 20 barrels allowable?

A. Yes, sir. Of course, the Commission couldn't keep that 690,000 allowable.

Q. Have you figured out how long it would take Rowan & Nichols to produce their recoverable oil, if the assumption I have made is true, taking your first assumption, 691,000 barrels per day from now on; then, the further assumption that the Commission is going to keep the base or minimum allowable at 20 barrels per day?

A. Yes, sir.

Q. Have you figured out how long it would take Rowan & Nichols, then, to produce their oil, if you make that assumption, and don't make it 75-25 per cent, but on the way it would work out if that was applied?

A. It would be impossible to make that calculation.

[fol. 410] Q. It would be impossible to make that calculation?

A. Yes, sir.

Q. Impossible to know just exactly what Rowan & Nichols would get?

A. Yes, because it would be impossible to produce the field at that rate.

Q. Impossible to produce it at the rate of 691,000 barrels a day?

A. When Rowan & Nichols is being drowned out, I think so.

Q. That is the assumption you have made on all of your calculations there?

A. All of those are relative, Mr. Hart. It doesn't make any difference if the field was cut to 300,000 barrels a day,

as long as it is on a 25-75 ratio, Rowan & Nichols' ratio of depletion would be in the same ratio as the depletion of the field. That is the only comparative basis that could be made on.

Q. I am asking you to make that comparative basis.

A. Yes, sir, that is the only thing it can be made on.

Q. Instead of assuming the base or minimum allowable is going to be increased to 30 or 40 barrels a day, assume that it is going to stay at 20 barrels a day, and by reason of that, as you say, the amount of proratable oil is going to increase?

A. Yes, sir.

Q. You say it is impossible to calculate how long it would take Rowan & Nichols to get their oil, if that were done?

A. Yes, because I don't know how many wells will be drowned out. You will have to give me some other factors to make that calculation with.

Q. If you are going to find out whether Rowan & Nichols will get their oil, you have got to make a calculation to base [fol. 411] it on?

A. You have missed the point——

Q. Just answer my question.

A. I can't make that calculation you asked for.

Q. The only kind of calculation you can make is based on an assumption of 691,000 barrels per day total allowable from now on, and 75-25 distribution of that allowable from now on?

A. Or any other allowable that you might want, based on 75-25. It would be in the same ratio then.

Q. All right, sir, and yet you have stated that the 75-25 ratio wouldn't continue if the Commission kept the 20 barrels base or minimum allowable?

A. With the 690,000 barrel top, it couldn't do it, naturally.

Q. It couldn't do it. All right. I want to just get briefly some figures from you, Mr. Buck. Where do you put the average water table to date?

A. I haven't made any computation on that for quite some time, Mr. Hart. I couldn't give it to you in level.

Q. Didn't you even try to do that when you were calculating the amount of depletion in the field?

A. No, I based it on flooded acre-feet of sand.

Q. Do you calculate the flooded acre-feet of sand without knowing how much the water has risen?

A. You know what the withdrawal has been from the field, and this can be computed backwards.

Q. Your calculation is just based on how much oil has been produced, and then assigning a certain production per acre-foot of that and dividing the one into the other, and you get the depleted number of acre-feet?

A. Yes, sir.

Q. And your estimate of the amount of recoverable oil [fol. 412] per acre-feet is 927.4 barrels; is that right?

A. That is correct.

Q. Is that the production to date, or is that the production from now on or both?

A. That is my calculated estimate of what the over-all recovery per acre-foot will be for the field, projected over the entire life of the field. The recovery per acre-foot at this time is higher than that. We have evidences of core data where over 95 per cent of the recoverable oil—amount of oil, 95 per cent of the oil in the sand has been flushed out by the water, which would give a recovery in a tract of 1200 barrels to the acre-foot. So the early recoveries have been higher, but it is my judgment that the over-all recoveries per acre-foot will be somewhere in the neighborhood of 927.4 barrels.

Q. Do you mean to say, Mr. Buck, that the 927.4 barrels per acre-foot recoverable oil is the amount of recoverable oil beneath an acre-foot of sand anywhere you take it in the reservoir?

A. That would be an average for the reservoir, and by these calculations I have shown that to be the recovery under Rowan & Nichols tract; however, it is my judgment that their recoverable oil there would be higher, but I have taken that as the average for the field, Mr. Hart.

Q. I want to get the variations in that, Mr. Buck. How far off might you be on that, if you wanted to apply it to any lease in the field? Would you be off as much as 200 or 300 barrels per acre-foot?

A. In the western edge of the field where we have had depleted leases, and have taken some core tests, and in some instances in the north end of the field where we knew where [fol. 413] the water level was, and we went back in and drilled another well to the original water level, and we found what the rise was, and later the effectiveness of the water flushing of that sand. Those—so that the appearances.

make that part of that earlier production within the neighborhood of maybe 1200 or 1250 barrels recovery per acre-foot, but that doesn't necessarily follow.

Q. All right.

A. That is, if the field depleted and you got that water head further removed from that effectiveness of that flushing action, that wouldn't continue sweeping the sands that clean, and so for that reason I have made an estimate not of one acre-foot of sand in the field, this one carrying 1260, and this one carrying 875, but I have taken 927 barrels as my calculation for what an average acre-foot of sand yield will be over the life of the field.

Q. Take that information you gave here of the original potential of 1250 barrels per acre-foot as against your average, you would be 30 per cent, wouldn't you, on the amount of recoverable oil underneath that lease?

A. That particular lease would produce 30 per cent more than the average of the field. That would mean, Mr. Hart.

Q. As you arrived at these figures, your estimate would be 30 per cent off?

A. I don't think so. That particular lease there in that particular area produced 30 per cent more than the average of the field, not that I am 30 per cent off in my estimate. I don't think so.

Q. Of course, if you take an average, it is just an average.

A. That is all.

Q. But if you are going to try to allocate oil on the basis [fol. 414] of recoverable reserves as against a minimum life, you are going to be as much as 30 per cent off?

A. If you apply 927 barrels to each acre-foot in the field, that is correct, Mr. Hart.

Q. All right, if you applied that average to some leases you might give them as much as thirty per cent more than the actual recoverable oil in place, might you not?

A. They would recover that much more than the average, that is true.

Q. Well, the question was this, there are some leases that have less original oil than that average you have stated there, and the fact that you applied that average, you might give them about thirty per cent more oil than they actually had in place, is that right?

A. Yes, sir.

Q. Well, I believe you spoke in reply to Mr. Baker of a certain formula you thought was a pretty good one, and

I believe you said under that formula there would be some leases that would get only fifty per cent of their recoverable oil, some of them would get only thirty per cent, some of them might miss it by fifteen per cent and so on?

A. You misunderstood that testimony, counsel.

Q. What was that?

A. I testified that after various producing rates up there in the field, for instance wide open flow, that the west side or some of those properties would lose fifty per cent of their recoverable oil that they had in place.

Q. Yes.

A. Now, under this regulated flow, twenty barrel minimum or something like that, that we have over here now, those properties are only losing from fifteen to twenty-five per cent.

[fol. 415] Q. I see.

A. They are better favored than they would be under open flow regulation.

Q. All right.

A. Now, there are correcting parts of this formula that can still bring them closer to that oil that they might have, recoverable oil in place. However, that wipes out, then, the structural advantage that one property might have over another.

Q. Do you mean by structural position there, do you mean to say the leases on the east side, they naturally have a longer life and therefore ought to be allowed to recover a little more oil than they originally had in place?

A. I don't mean to distribute any of this oil or say what one should be allowed to produce over another. I am saying that you give me any set of circumstances you want to give me and I will tell you the effect of distributing that oil or what they had of recoverable oil in place.

Q. I want to get what you mean by structural position. Do the leases on the east side have a structural advantage by reason of the fact that they are over there on the east side where the top of the sand is high and where the sands are permeable and so on?

A. They have a structural advantage under regulated withdrawals. No structural advantage under wide open flow.

Q. And any method of regulated withdrawal would give them some structural advantage, is that correct?

A. Yes, sir.

Redirect examination.

Questions by Mr. Moody:

Q. Mr. Buck, with reference to the present estimated, [fol. 416] revised original estimated recoverable reserves, as shown on Rowan & Nichols' Exhibit No. 27, as compared with the estimated recoverable reserves as stated in the trial of the prior Rowan & Nichols case, explain to the court or state to the court, please, why the change in those figures?

A. Well, in the first place you realize that we have a tremendous reservoir there to deal with, and the earliest maps that we worked with, and were accepted maps, delimited an area of this field of 133,000 and some producing acres. Now, the map that I am working with now and checking and the amount of leases that are paying taxes on producing leases in the East Texas field, those two things conform, and it shows a delimited area of 131,749 acres. In making the first calculations there we had some 400 Schlumberger logs, or between 400 and 500, and core records to work on in making all of the deductions that we thought were necessary in our first calculation, and we computed the total Woodbine section of the field was in excess of five and a half million acre-feet, and then we went further in these calculations and taking the data we had and we struck an average of sixty-eight per cent of that sand as being saturated with oil. So we made the calculation first on the total Woodbine section and secondly struck a straight average of sixty-eight per cent for that whole field as being saturated. Since that time and since the trial last February considerably more data has been made available, not only to the Railroad Commission but to various companies, and including me. Independent surveys of this condition over there have been made. I have made these calculations that are shown there and the Railroad Commission has made calculations that are within one-tenth of one per cent [fol. 417] of these. Now, the Tidewater, the Shell, the East Texas Engineering Association, and others have been working independently of each other and they have checked within one or two per cent of these figures. That is the best we can do. If next year we had another thousand Schlumbergers to work with all of our estimates would perhaps be revised either upward or downward, but I believe that any ten or fifteen engineers working with this problem with the

same data would come within one or two per cent of the same answer, and so long as we have the total field limits and the volume all corrections up or down are relative, and it doesn't make any difference.

Q. Then the difference in the figures is because of additional information in the way of records on how many additional wells that have been made available in the last year? Did you state that?

A. I had access to over a thousand Schlumberger logs that are indicated on this map. Quite a few of them penetrated the entire Woodbine section into the Georgetown. Quite a few others penetrated the entire oil saturated zone and went into the water. We were able to take those logs and deduct the amount of shale, foreign material, out of the total sand section, and the map that is on the board there now is made from net oil saturated sand and not Woodbine section. Each area inside the contour has been weighted and calculated and it came to this total of 4,990,350 acre-feet of saturated sand.

Q. And you say the Railroad Commission was within what per cent of that?

A. The Railroad Commission is 4,961,000.

Q. 4,961,000, and that is 4,990,000?

A. Yes, sir.

[fol. 418] Q. In any event, the changes in figures is due to additional information having been made available or obtainable within the last year?

A. That is correct.

Q. Now, if you drop back to the estimates that were in evidence a year ago as to the original or expected recoverable oil in the field and under the Rowan & Nichols tract, or base it on the figures obtainable a year ago, and what you have today, would the ratio be about the same in these revised figures?

A. Yes, sir, because in all instances we treated the Rowan & Nichols tract as average all the way through and applied those same correcting factors each time, so I think whatever base of calculation is taken the answer would be relative.

Q. Now, the next figure, the production of 1,447,000,000 from the field and 493,000 on the lease, those figures are with the figure Mr. Hart furnished, I think, of 140,000 for the last year, they are about the same?

A. Yes, sir.

Recross-examination.

Questions by Mr. Hart:

Q. Mr. Buck, you spoke of certain correcting factors that you have learned about since last year that caused you to change your estimates thirty per cent. Just what are those correcting factors or additional information you based the changes on?

A. Principally data we were able to accumulate in the past six months. If you recall, the Commission sent out a questionnaire to all of the companies asking them to fill out certain information similar to what the Humble did fill out. This resulted in a very free exchange of information during the last six months, although before that we had had a [fol. 419] good exchange it hadn't been free. We have a tremendous amount of statistical data on the size of the leases, the number of acres in the lease, the wells that are on the lease, core records, driller's logs, Schlumberger records and coring records, water percentages, and things like that, that have never been made available for a complete study of this field until the Commission asked for that in this questionnaire. Now, there have been some nine or ten independent calculations made on this. I have had occasion to, since making my calculations, check most of those, including Mr. Hundall's, the Humble's, the Gulf's, Tidewater's, the East Texas Engineering Association's, and the Sun Company's, and all of those calculations naturally, because of the free exchange of information, although worked independently, checked fairly closely, and it just happened that the additional data made available caused the raising of these figures some thirty per cent.

Q. Is that all?

A. Yes, sir.

Q. Here on Plaintiff's Exhibit No. 28, Mr. Buck, you show a red line there, which I believe you called the neutral line, and you said all places to the west recover less recoverable oil than was originally in place, and all places to the east would recover more, is that correct?

A. Yes, sir. That is, of course, based on the present allowable.

Q. Where is Mr. Fischer's lease located there with reference to that line? Is he going to get more or less of the recoverable oil originally in place under his lease, according to that map?

A. I will have to examine the map.

Q. All right. I think it is near the London townsite.

Mr. Moody: We had the description of it a minute ago. I think I can give you that, Mr. Hart.

[fol. 420] A. Mr. Hart, this is such a small scale map that I can't find the lease exactly, but it is located in the approximate vicinity as indicated by the pencil and marked with a red dot. Now, that lease would fall some six or about five thousand feet, or a little over a mile west of the line, and would fall in the category of the acreage that would suffer drainage by the eastward movement of the water.

Q. Do you mean to say, Mr. Buck, that Mr. Fischer's leases won't recover the equivalent of the original recoverable oil underneath that lease?

A. No, I think Mr. Fischer will get his.

Q. You think he will get his?

A. Yes, sir.

Q. Well, there are a good many leases like that to the west of that line you have drawn that are going to get more than the recoverable oil originally in place, aren't there?

A. Yes. You can find up and down that line isolated areas where there is very dense drilling and heavy withdrawals, that for that particular lease will give up more oil than it had originally, but the one hundred foot per acre withdrawal of the area would still suffer drainage to the east. In other words, one man in there gets more oil than he is entitled to, that is true.

Q. Why is that?

A. Under a scheme of giving in accordance as their per cent bears to the reserve——

Q. Well, you know Mr. Fischer is going to get more?

Mr. Moody: Let him get through.

Mr. Hart: Pardon me, I thought he was through.

A. The one hundred acre-feet per day withdrawal in that area is taken to the disadvantage of the surrounding one hundred acre-feet area, and the line indicates for the gen- [fol. 421] eral part of the field that gains or loses. It doesn't attempt to divide it exactly. A man who has one-hundredth of an acre with two wells on it, you cannot say that man is not going to get his oil, because the forty-fourth day he produced he will have the recoverable oil that he had in place, his per cent that his reserves bore to the field.

Q. Mr. Fischer is drilled more densely than the average of the leases in that vicinity so he is actually going to get his oil, although he falls how many feet west of that line?

A. About 5,000 feet.

Q. About 5,000 feet?

A. Yes, sir.

Q. Well, how far west of that line that you have drawn is the Rowan & Nichols Todd "A" lease, about how many feet?

A. It is right at 3,000 feet.

Q. Right at 3,000 feet?

A. Yes, sir.

Q. Well, the leases to the west of that line, then, that are more densely drilled than the average of the leases in that same part of the field are going to have a better chance of getting their oil than the leases that are just drilled to the average of the field in that vicinity, isn't that true?

A. No. In comparison, Mr. Hart, we can say this here is a grocery store and there are a thousand people in here to get five hundred loaves of bread, and we are going to be turning up here five hundred loaves short. Now, there might be some man, instead of getting one loaf he might go in there and get six loaves, but we still wind up five hundred loaves short of this deal. That oil has been moved eastward by the eastward movement of the water.

Q. If you want to apply that to the leases as they actually exist and whether there is any relation between that and the [fol. 422] recoverable oil they originally had in place, that line wouldn't look like that, would it?

A. It wouldn't be a line then, it would be a bunch of circles and spots.

Q. That is exactly what I am getting at. And if you are going to correct that line to show the actual amount of oil recovered, especially as to leases that are more densely drilled than the average of the leases in that vicinity, you would have to move it westward as to some of them and maybe some of them eastward, as to the leases that are less densely drilled than that area, isn't that true?

A. That line could only represent, under the present allowable, what section of the field is gaining oil and what section of the field is losing oil. It couldn't in any way identify Mr. Fischer's property or other property similarly located west or east of that line.

Q. Well, it couldn't identify any properties that are west or east of the line?

A. That is correct.

Q. Well, it wouldn't have any relation, then, to the Rowan & Nichols lease, would it?

A. Oh, yes.

Q. Except to show that Rowan & Nichols are in the general vicinity where you say on the average they are going to lose a little oil?

A. Oh, yes. In the Rowan & Nichols situation and properties lying west of the line, considering the relation their reserves bear to the reserve of the field, will suffer in some thirty-six per cent, but it wouldn't necessarily mean that if Mr. Rowan went in and drilled twenty-nine more wells [fol. 423] on his land and was permitted to produce a bunch of oil in there that that would be true. It only applies to him as to his particular position at this time.

Q. Well, he is a little more densely drilled than the average of the field, isn't he?

A. On surface acreage, yes.

Judge Sibley: Do you have another witness?

Mr. Moody: No, sir, I have no other witness. I only would like to show in the record, in view of Mr. Hart's question about the Fischer lease, the comparative number of acre-feet under his leases and his recoveries as compared with the Rowan & Nichols lease. It was stated, but they have not been proved.

Redirect examination.

Questions by Mr. Moody:

Q. Have you made a check of that?

A. Yes, sir.

Q. How many acre-feet of sand are there under the Fischer land?

A. 5,006.7.

Q. That is less than twice as much as the amount under the Rowan & Nichols?

A. Yes, sir.

Q. How much oil is the Fischer land allowed to produce per day?

A. 1,692.82 barrels per day, that is his allowable.

Q. That is somewhere around six or seven times as much as the Rowan & Nichols allowable?

A. Yes, sir.

Recross-examination.

Questions by Mr. Saye:

Q. Mr. Buck, is it your contention that Mr. Fischer would [fol. 424] recover just as much of the oil in place under his land if he would drill one well on thirty acres as if he would drill five wells on thirty acres, or more than one well on thirty acres?

A. Of course, Mr. Saye, a recovery would come right back to the manner in which the allowable is prorated between wells. Under any of the past or present orders of the Commission he would, of course, recover less oil at a well to thirty acres than he would a well to five, and he would recover more from a well to half an acre than he does a well to five.

Q. Do you know of any formula that could be adopted whereby he wouldn't recover more oil in accordance with the more wells drilled on his lease?

A. Mr. Fischer's lease?

Q. Yes, or any other lease over there?

A. Yes, sir.

Q. Why would he recover more?

A. Sir?

Q. What would make it different?

A. Put the allowable to his tract, not to the well. In other words, it wouldn't make any difference—say he had a five barrel minimum over there to his tract. He could take a half barrel or a fifth of a barrel out of each well or he could take it all out of one well.

Q. Do you contend that one well on thirty acres will recover as much of the recoverable oil in place as four wells drilled on the thirty acres would?

A. That, of course, would depend entirely on the method in which it is prorated, the way it is distributed in the field.

Q. Do you know any way in which you can recover all of the original oil in East Texas by drilling one well on thirty acres?

[fol. 425] Judge Sibley: There are not any drilled in that way. Why should we worry about that? Everybody agrees

there are plenty of wells to do the draining. Whether or not this formula gives them an undue advantage is about the only question in the case.

Mr. Saye: Your Honor, I think the question is if a man has twenty acres——

Judge Sibley: Let's not argue. Just ask the questions, we will save time.

Q. Will you answer that, Mr. Buck, will he recover just as much oil through one well as he will five wells, on thirty acres?

A. No, not under any plan of proration you have over there.

Q. Not under any plan of proration?

A. That has been in the field to date.

Q. Will he under any plan you suggest, or what plan would he recover it under, if you say he would?

A. He possibly could maybe not on a well to thirty acres. A well to twenty acres or twenty-five acres with an allocation there for reserves, based on his per cent of the field total and corrected for pressure, it could be done.

Q. Then do you think one well will drain from twenty to twenty-five acres?

A. If the pattern of the field was that, I believe so, yes.

Q. But that pattern would have to have been adopted when the field was started, and the field practically uniformly drilled, wouldn't it?

A. Oh, yes.

Q. To accomplish that result?

A. They would have had to have a more or less uniform pattern.

Q. And you can't base an order on any such pattern as that at this time?

A. Not if you take every well that is over there you couldn't, no.

[fol. 426] (Witness excused.)

* * * * * * *

Mr. Moody: That is all, may it please the Court, from the Rowan & Nichols Oil Company, and we press our application for an interlocutory injunction, and submit the case on its merits.

Judge Sibley: Mr. Baker, are you ready to wind up yours?

Mr. Baker: I believe Mr. Hart wanted to ask Mr. Sorenson some questions, and then I wanted to submit some documentary evidence.

* * * * * * *

I. L. Sorenson, was recalled for further recross-examination; and testified further as follows:

Recross-examination.

Questions by Mr. Hart:

Q. Mr. Sorenson, I asked you, among other things, for your figures on the current number of acre-feet under the Humble leases. Now, what is that figure?

A. What is that?

Q. That is No. 3 there.

A. 595,277 acre-feet.

Q. Now, you have here under your No. 4, what is that? Is that the variations in the amount of shale on the west side of the field, as shown in your cross sections, beginning with AA and running through GG?

A. Yes, sir. I understood your question as a measurement of the shale and sand in the sections across the field, and using the westernmost wells on that section.

[fol. 427] Q. Does that show the amount of variation in shale on those cross sections, in each of those cross sections, the lowest figure, is that the lowest percentage of shale there, and the highest figure, is that the highest percentage, or what is that?

A. No, I have listed each well that was used in the section, and this tabulation shows the exact amount of shale and sand that was encountered in those wells as shown by the electric logs, and I have the logs here for you.

Q. On your cross section AA, then, do you mean this is an average of the different wells that were shown on each of these different cross sections? You have a figure of a certain percentage of shale and sand. Now, does that apply to an average of the wells in that cross section, or just the wells that were shown on the east side, or what?

A. The west well.

Q. The west well?

A. I understood that was what you wanted.

Q. Then in your cross section AA there was thirty-six per cent shale and sixty-four per cent sand, is that correct?

A. Yes, sir.

Q. In your cross section BB there was thirty-six per cent shale—36.5 per cent shale, and 63.5 per cent sand?

A. Yes, sir.

Q. In your cross section CC there was five per cent shale and ninety-five per cent sand, is that correct?

A. Yes, sir.

Q. And in your cross section DD there was fourteen per cent shale and eighty-six per cent sand, is that correct?

A. Yes, sir.

[fol. 428] Q. In your cross section EE there was 8.9 per cent shale and 91.1 per cent sand, is that correct?

A. Yes, sir.

Q. In your cross section FF there was 8.1 per cent shale and 91.9 per cent sand, is that correct?

A. Yes, sir.

Q. GG there was 21.4 per cent shale and 78.6 per cent sand?

A. Yes, sir.

Q. Now, this is the percentage on the westernmost well on each of those cross sections you introduced, is that correct?

A. That is right.

Q. Now, under this No. 5 here you have a figure for the recovery per acre-feet in the past production of the field. Apparently that is based on the assumption that the water level—is that assuming that all of the oil was above the water level of minus 3320? Is that what that assumption is?

A. Yes, sir.

Q. Based on that you have a recovery per acre of 1,499 barrels per acre-foot to date, is that correct?

A. Yes, sir.

Q. That is a correct assumption to make, whether the oil was above the minus 3320 original water level or not?

A. I used that 3320 as an exact line. However, it varied somewhat.

Q. It varied up and down, is that correct?

A. Yes, sir, and the amount of oil in the sand section varied. There is oil below 3320, but the percentage of oil is so low that it will not make a commercial well at that depth. However, some oil will advance with the water and be produced, and that accounts for that very high figure.

[fol. 429] Q. In other words, this estimate of 1,499, in your opinion, is a reasonably accurate estimate of the

amount of recoverable per acre-feet throughout the field to date, is that correct?

A. On the assumption as stated there.

Q. And you say that that is a reasonable assumption to make, is that correct, on the average?

A. I have explained the 3320 as being an accepted figure, but oil, some oil from below that point has been produced to account for that figure.

Q. Some of the oil was originally higher than that, wasn't it?

A. That has been produced?

Q. No, I mean that the water level in some places was higher than the minus 3320, wasn't it?

A. Perhaps it was.

Q. So if you take a 3320, you make an average and that is a reasonable assumption to make?

A. In the early days of the field we made that assumption.

Q. Now, you also have here that the Humble production to June 1, 1939, was 131,364,982 barrels, or you say 1,095 barrels per acre-foot, based on the same assumption, on the Humble leases?

A. Yes, sir.

Q. Now, do you mean by that that the Humble—that the sand under the Humble leases was less productive on the average?

A. No, sir, that merely means that our percentage of the allocation was less.

Q. Well, the average recovery per acre-foot was 1,499 barrels, is that correct?

A. Yes, sir, on the assumption as stated.

Q. All right.

A. In the answer.

[fol. 430] Q. And this figure of 1,095 barrels, how did that come about? Did you arrive at an estimate of the number of acre-feet depleted under the Humble leases and then divide that into the total production from the Humble leases and get 1,095, is that the way you got that?

A. Yes, sir.

Q. That is the way you got that?

A. Yes, sir.

Q. I believe you say here you have no record of the excess oil produced from the Humble properties prior to the time the Humble purchased them, is that right?

A. That is correct. We can get that figure from the Comptroller, but these—you have to trace the record and ownership of those leases prior to our purchase.

Q. Would that take some time to do it?

A. I am afraid it will, but I will be glad to do it.

Q. I won't ask you to do it at this time. Now, do you have here under No. 7—you have the figure for the amount produced from the properties purchased by Humble prior to the purchase, and you have the figure there of 1,911,523 barrels. Does that include allowable oil only, or hot oil too?

A. That is the oil that we have a record of by pipeline runs kept monthly from leases, all leases.

Q. Now, Mr. Sorenson, there was certain other things I asked you about. I won't necessarily ask you to get them, but there is one point, one thing I would like to ask you. I asked you in your opinion what was the probable recovery per acre-foot in the field in the future. Do you know what that is? Have you made any estimate of it?

A. Future production?

Q. Yes, sir.

A. Well, just an estimate, some 900 barrels per acre-foot.

[fol. 431] Q. In your opinion, some 900 barrels per acre-foot?

A. Yes, sir, a conservative estimate.

Q. That is about 600 barrels per acre-foot less than has actually been produced to date, isn't it?

A. That is true, getting back to the assumption that the original figure is based on.

Q. Now, I did ask you for the number of abandonments that have taken place on the Humble leases and the decrease in the productive acreage from the Humble leases, if any. Is that impossible for you to get or not?

A. No. You asked for so many things, and we got——

Q. I understood Mr. Rauhut was taking them down, and I thought you had a list of them.

A. This is all I have on the list, but I will find those wells for you.

Q. Well, I don't want to ask anything unreasonable of you. Can you get it without too much trouble? I would like to have an accurate figure on the abandonments on the Humble leases and the number of acres you have taken off your list of productive acreage, if any.

A. I believe I can get that for you without any trouble.

Q. Now, Mr. Sorenson, on further cross examination I want to ask you about your testimony in another case. Do you recall testifying on behalf of the Humble Oil & Refining Company in cause No. 59,295, in the 98th District Court of Travis County, Texas, entitled Humble Oil & Refining Company vs. Railroad Commission of Texas and others, which trial began on June 6, 1938? Do you recall that case? Do you recall testifying in that case?

A. I testified in that court, but I can't identify the case by those numbers. Who else besides the Commission was it [fol. 432] against?

Q. I don't have that now, I don't know. Well, let me ask you do you recall testifying in that court at about that time in response to questions by Mr. Rauhut, the attorney for the Humble Oil & Refining Company?

A. I perhaps was there. I don't recall the case particularly.

Q. Well, let me ask you if you didn't give this testimony, as shown here by the Stenographer's notes. I will ask you if you didn't testify this, and I am reading here from the stenographer's notes, with reference to the East Texas field: "The thinner sand areas to the westward if allowed to be drilled to the same density as the thick sand section would be a fair proposition because the lower structure wells would be drowned out at an earlier time and the thick sand section wells would produce longer and thereby recover their fair share of the oil." Do you recall testifying to that?

A. Yes, sir, that was based on uniformity of drilling.

Q. All right, and it was also based on the proration formula which was then in existence, which was substantially a per well allowable, isn't that true?

A. Yes, sir.

Q. Then I will ask you the following question, ask you if the following questions were not asked you and if you didn't give the following answers: "Q. Then, according to your contention, one well in an area where there is 100 feet of sand will drain an area just as far as a well located in an area where there is ten feet of sand, all things being equal?

A. Yes, sir, the longer life will make up the difference.

Q. Does that apply to the east side of the field too?

A. It applies to the east side in the sands if they are higher on the structure and the permeable sands they will have a very long life, but beyond the fairway going eastward

[fol. 433] the dense tight sands will have a shorter producing life. They will die out because not enough pressure there to shove any oil into the wells in the tight sand areas. They will die out sooner. That is being effected now. We are feeling that on a good many leases at this time."

—. Do you recall testifying to that?

A. Yes, sir, that is that narrow strip we have been talking about.

Q. All right, I will ask you if the following question wasn't asked you and you gave the following answer: "If you had a per well allowable and you were confronted with that situation where the wells were all producing practically the same amount, do you still say that the man who has the thick sand, the 100 feet of sand, with one well, is entitled on ten acres, is in just as fair position as the man who has one well on ten acres in an area that has ten feet of sand?

A. Yes, sir, I have explained that to you, that the thin sand section will be exhausted so much sooner."

—. Do you recall testifying substantially to that, Mr. Sorenson?

A. Yes, sir. We were talking about the uniformity of drilling.

Q. All right, just one more question. Was this question asked you, and did you give the following answer: "In arriving at the number of wells a man is entitled to drill in any given area you give no consideration whatever to the thickness of the sand, that is not a factor you would take into consideration?

A. No, I would consider the adjoining tracts to the lease in question. If you maintained that average you will get your fair share of the oil."

—. Was that question asked you and did you give that answer?

A. If it is in that record that is so.

Mr. Hart: That is all.

[fol. 434] Redirect examination.

Questions by Mr. Baker:

Q. Mr. Sorenson, you testified here with reference to the recoveries on the west side. Now, isn't it true that minus 3320, taken as the average level at which you will get pipeline oil, if you complete a well to that depth?

A. If you top the sand at that depth.

Q. Now, is it or not true that below that level there was quite a bit of oil—saturated, mixed in with the water?

A. Yes, sir. It is not a sharp line of demarcation. It is a gradational zone.

Q. A gradational zone. Is that zone ten or more feet wide, in your estimation?

A. Yes, sir, we found saturation below 3320. However, a well completed below that point will not make a clean oil well.

Q. I believe Mr. Moore estimated that the probable actual recoveries per acre-foot of sand depleted was 1,100 barrels instead of the figure here quoted. Do you agree with that or not?

A. Yes, sir, I agree with that.

Q. And the difference, you think, is made up by oil that came from below the place——

Mr. Hart: If the Court please, this is still his witness. We object to his leading and telling the witness what he wants him to testify.

Judge Sibley: It is rather leading.

Mr. Baker: I was doing that to get over with it. It was leading, Your Honor. I will withdraw the question.

Q. Do you or not believe that this oil coming from the deeper zone accounts for the difference?

A. Yes, sir.

Q. Now, I want you to look at this table, Mr. Sorenson. I [fol. 435] am afraid I will have to look on the table with you in order to ask the question. Are you familiar with that table?

A. Yes, sir.

Q. What does that table show with reference to the average recovery per acre-foot of sand depleted in the field up to this time?

Mr. Hart: He hasn't yet testified that those are his estimates and that he believes them to be correct, and I don't know whether they are his or Mr. Moore's.

Q. Will you examine that, please? Are you familiar with the estimates there, recoveries per acre-foot?

A. Yes, sir.

Q. Do you believe they are correct, from your own knowledge?

A. Yes, sir.

Q. Now, what is your estimate of the past recovery per acre-foot of sand depleted, assuming that the water level was minus 3320?

A. 1,499 barrels for the field as a whole.

Q. What would the comparable figure be for other operators besides Humble in the field?

A. 1,561 barrels per acre-foot.

Q. Would Humble be on the same comparable basis?

A. 1,095 barrels.

Q. What is the difference between those two, how much?

A. 466 barrels per acre-foot.

Q. 466 barrels per acre-foot?

A. Yes, sir.

Q. What does that mean with reference to drainage from the Humble properties?

A. There has been a drainage to that extent.

Q. How many acre-feet of Humble sand do you figure have been depleted?

[fol. 436] A. Humble has had 120,026 acre-feet drained.

Q. Now, if you multiply that by 466 barrels per acre-foot, what will that amount to in barrels?

A. 55,932,000 barrels.

Q. Will you state whether or not, in your opinion, that is a fair representation of the net amount of oil that Humble has had drained from under its leases up to this time, approximately?

A. Yes, sir, I think it is a reasonable figure.

The Court then, at 12:05 p. m., Thursday, February 15, 1940, was recessed in this case until 2:00 o'clock p. m. of the same day, when the following proceedings were had:

[fol. 437] Thursday, February 15, 1940,
Afternoon Session: 2:00 o'clock.

Mr. Baker: I have no further questions, Your Honor.

Judge Sibley: Any questions, Mr. Hart?

Mr. Hart: No, sir, I don't have any.

Judge Sibley: Well, I believe that completes the case of all the three complainants.

Mr. Baker: I want to introduce some documentary evidence at this point, Your Honor.

Judge Sibley: Are you ready with that now?

Mr. Baker: Yes, sir.

Judge Sibley: All right.

Mr. Baker: This is on the issue as to whether or not the Humble Oil & Refining Company used due diligence prior to filing suit.

I wish to introduce a copy of Exhibit A of the Humble Oil & Refining Company's original complaint. I am not going to detail it in particular except to say that this protested against the allowable in June and ask for an adjustment of the allowable and such an adjustment as would give to the Humble Company its fair share of the oil, and requested a hearing on both—a hearing by the Commission, and an opportunity for the Humble Company to make the necessary proof, and then requested that the adjustment be made.

Judge Sibley: Was any action taken on it?

Mr. Baker: Sir?

Judge Sibley: Did the Commission take any action on it?

Mr. Baker: Yes, sir, the Commission held a hearing on [fol. 438] August 16th following. At that hearing a mass of evidence was introduced and after the hearing was had and after the injunction in this case was granted at San Antonio the Commission issued its order of September 11, 1939, which, as the Court knows, is substantially the same as the present order. Now, in the meantime, the Railroad Commission——

Judge Sibley: Well, it acted on this only indirectly then?

Mr. Baker: Yes, sir.

Judge Sibley: By issuing a new order?

Mr. Baker: Yes, sir. In the meantime the Railroad Commission, during the month of August, sent out a questionnaire to the Humble Oil & Refining Company, in which it requested that the company furnish to the Commission certain information with respect to each of its leases in the East Texas field. Among other things, it propounded this question, which was No. 12: "What do you think the total allowable for the wells on this lease should be in order that you might recover your fair share of oil in the East Texas Field, if the total allowable of the East Texas Field remains as it is at this time?" In answer to that inquiry—that related, of course, to a particular lease. The company stated in effect that it wished—that it ought to have that proportion of the field allowable which equaled the ratio between its——

Mr. Hart: Excuse me, Mr. Baker, are you going to introduce your letter which you sent with the questionnaire?

Mr. Baker: Yes, sir.

Mr. Hart: All right. That speaks for itself.

Mr. Baker: Well, I just wanted to state the substance of it into the record. It suggested pro-ration on the basis of [fol. 439] the ratio between the number of acre-feet of oil sand in the field as a whole, and then it said the pressure factor may also be considered. "See covering letter". Now, in the covering letter this statement was made—by the letter of August 8, 1939 from the Humble Oil & Refining Company to Mr. John E. Taylor, Chief Supervisor, Oil & Gas Division, Railroad Commission. Among other things this letter stated: "In answer to Question 12, we have suggested the following formula: $\frac{\text{acre-feet of oil sand in lease}}{\text{acre-feet of oil sand in field}} \times$ field allowable. It is to be understood, however, that it may be entirely proper to apply the pressure factor or to consider the location of the lease on structure. There are other formulae which would probably give substantially the same result. It is our idea that whatever the formula may be, the object should be to prevent reasonably avoidable drainage between competing properties, which drainage is not substantially offset by counter drainage".

Mr. Hart: Mr. Baker, are you introducing the last paragraph of your letter, too?

Mr. Baker: Yes, I will introduce that. The last paragraph reads as follows: "Whatever its legal rights may be, the Humble Company, as a practical matter, would offer no objection to an order applying the formula mentioned above or another formula achieving substantially the same result and, in connection therewith, prescribing a reasonable minimum unit allowable". Now, the Railroad Commission held——

Judge Sibley: By "unit" you mean well unit?

Mr. Baker: No, sir, that was not what we meant. We meant a unit—either an area unit or acre-feet unit and not a well unit.

Now on September 11th, 1939, the Railroad Commission held a State-wide hearing and at the State-wide hearing Mr. [fol. 440] Sadler, one of the Commissioners, stated this: "At this time, Mr. Chairman, I wish to read the proposed order on the East Texas Oil Field, in conformity with the agreement made by the Railroad Commission". That was in the opening of the hearing. Now, he read the proposed

order, which according to my understanding, is the same as the order which was actually issued. Then Mr. Hines Baker, who is one of the Directors of the Humble Oil & Refining Company, and who was representing the Company at the hearing, got up in the open meeting and protested against the issuance of this order by the Commission. Now I am not going to take the time to read all of this to the Court except to—I will merely say that I wish to introduce this in evidence (referring to certified copy of excerpt of testimony at hearing before Railroad Commission in Austin, Texas, on September 11th, 1939), and to state that in here Mr. Baker very clearly stated the company's reasons why it didn't think the order should be issued. The principal reason was that it would not afford to the company an opportunity to recover its fair share of the oil.

The Railroad Commission, of course, has since issued other orders, and has not complied with the request of the company to make a further adjustment of its allowable. As a consequence, as soon as it could do so, the company filed its second supplemental complaint in this action, complaining against the orders of September 11th and September 29th, and, of course, it is now prosecuting its suit as diligently as it can. I would like to introduce a certified copy of the excerpt from the record taken at the State-wide hearing on September 11th, which covers the Humble Oil & Refining Company's final protest.

Mr. Hart: Mr. Baker, of course this does not purport to be a transcript of everything that took place at that State-wide hearing, does it?

[fol. 441] Mr. Baker: No, sir.

Mr. Hart: Or everything that was introduced?

Mr. Baker: No, sir, it is just an excerpt.

Mr. Hart: You will agree, will you not, that the evidence that was heard on the application of the Humble Oil & Refining Company was introduced in evidence at this State-wide hearing, was it not?

Mr. Baker: Well, my understanding is that it was.

Mr. Hart: I might just state in reply to the question which Judge Sibley asked, that the Commission, as the result of this hearing, changed the order for the whole field; it did not change it just for the Humble but for the whole field.

Judge Sibley: Yes, sir, I understood it was just a——

Mr. Hart: It was a direct action on that, but of course they wanted to apply what they did to everybody in the field, and not just to the Humble.

Mr. Baker: Our complaint, of course—our continuing complaint is that they made a partial adjustment but did not make a sufficient adjustment.

Mr. Hart: If the Court please, Mr. Rauhut called my attention to one thing, and I am glad to state the facts. He said they are the facts, and I will take his word for it. The particular questions and answers which Mr. Sorenson made in the case, about which I asked him this morning, were questions which were asked by Mr. W. T. Saye, one of the attorneys for one of the other parties in the case, and were not questions asked by Mr. Rauhut.

Mr. Moody: Mr. Hart, may it be stipulated in the record as far as the Rowan & Nichols Oil Company is concerned, that since the order became effective in September, 1939 [fol. 442] down to the order of January 24, 1940, the method or plan of pro-ration in the East Texas Field has been the same.

Mr. Hart: Well, Governor, that statement is so broad that I don't like to make it in exactly those terms. The same factors have been used, the number of shut down days have varied, I think; in the last order, the shut down days have been applied to the statutory marginal wells, and I think the top allowable has varied somewhat.

Mr. Moody: Well, the formula—I will put it that way, the formula for the distribution among wells for the field has been the same, has it not?

Mr. Hart: I think so.

Mr. Moody: Can it also be stated in the record that the Rowan & Nichols Oil Company filed a protest to these orders of the Railroad Commission?

Mr. Hart: I don't know exactly what form that was in. I think they did file a protest at one of the meetings. My recollection is. Mr. Tilley introduced one up there.

Mr. Moody: All right, sir, that is satisfactory.

Judge Sibley: Are you through, Mr. Baker?

Mr. Baker: Yes, sir.

Judge Sibley: All right, Mr. Hart.

Mr. Hart: Doctor Patten, will you take the stand, please?

[fol. 443] F. V. L. PATTEN, a witness for defendants, having been duly sworn, testified as follows:

Direct examination.

Questions by Mr. Hart:

Q. State your name, please, sir.

A. F. V. L. Patten.

Q. Doctor Patten, are you connected with the Railroad Commission at this time in any capacity?

A. I am, in the capacity of Director of production.

Q. Doctor, what is your profession or occupation?

A. I am a Chemical and Petroleum Engineer.

Q. What training or education did you have for that profession?

A. I received the degree of Bachelor of Science in Chemical Engineering from the University of Texas in 1931, and the degree of Master of Science, in Chemical Engineering in 1932, and the degree of Doctor of Philosophy in 1935.

Q. Have you taught in any institutions in the State?

A. I have taught Natural Gas Engineering for one year in the Texas A. & I. College.

Q. What practical experience have you had during your connection with the oil industries in Texas, and particularly in connection with the East Texas Field?

A. I spent one year with the Commission between 1935 and 1936 as Chemical Engineer, and from June of 1937 until May of last year I was employed by the Commission, as Research Engineer, doing research work in various fields in the State; since that time I have been Director of Production.

Q. In the course of your employment by the Railroad Commission of Texas have you had occasion to make a study of the East Texas Oil Field?

A. Yes, sir, I have.

[fol. 444] Q. State, in general, Doctor, what your information has been derived from—what records, if any, and what personal information you have made, and so on.

A. I have done considerable work studying the bottom hole pressure in the East Texas Field at various times, and

the various producing rates, and in addition to that, made general studies of field conditions, including the water production from wells in the different portions of the field, and we have made a study of bottom hole samples taken from wells in the field.

Q. Now, Doctor, you have heard certain statements here about the East Texas Field being essentially a water drive field; is that correct?

A. In my opinion, it is.

Q. Now, have you made a study, and have the persons under you done work for the purpose of ascertaining the facts as to whether or not the enforcement of pro-ration in the East Texas Field has any relation to the prevention of physical waste in that field, or the recovery of a larger amount of oil from the reservoir than would have been recovered under open flow conditions?

A. I believe unquestionably that there has been and will be a substantially larger production from the East Texas Field because of restriction in production. Restriction in production at the present time has made it possible to produce something on the order of a billion, four hundred million barrels of oil from the Field while maintaining the pressure in most of the field above the saturation pressure, that is the pressure at which gas begins to come out of solution and it is, I believe, well established that the maintenance of gas in solution does, particularly in a water drive field, increase the efficiency of the flushing action of the water drive and the water that replaces the oil.

[fol. 445] Q. Generally speaking, would you say, then, that throughout the field there will be a larger recovery of oil from the field by reason of the enforcement of pro-ration than there would have been under open flow unrestricted conditions?

A. Yes, I believe that unquestionably there will be a greater production from the field as a whole because of restricted production.

Q. Now, the restriction of the production from the field as a whole has caused a relatively slow drop in the bottom hole pressure, and has that any relation to the prevention of physical waste of oil?

A. I couldn't answer that question exactly as you have asked it. The maintenance of the bottom hole pressure in the field, at a point above the saturation pressure is important, or the maintenance of as much of the gas in the

field in solution as possible is of extreme importance in getting the greatest amount of recovery, and restriction of production has made it possible up to the present time to keep the pressure in the field—in most of the field, except for some very small areas, above the saturation pressure.

Q. What was the average bottom hole pressure in the field at the time the field was first opened?

A. The average bottom hole pressure in the field at the time the field was first discovered was about 1625 pounds per square inch.

Q. What is the average bottom hole pressure in the field at this time?

A. Something on the order of about 1063 pounds per square inch.

Q. What is the pressure at which the gas will come out of solution in the East Texas Field?

[fol. 446] A. The figure which is—which has been generally accepted is 750 pounds a square inch, although our tests in the field did show that it was not exactly uniform all over the field; it appeared that in certain portions of the field it was somewhat lower than that.

Q. Doctor, has the Railroad Commission prepared and kept up to date, or substantially up to date, a chart which shows the relation between the production of oil in the East Texas Field and the maintenance of pressure in the field, or the lowering of pressure, as the field has been produced to date?

A. Yes, we have kept a chart constantly for the past several years, on which we have recorded the results of the monthly bottom hole pressure surface in the field while the field was being produced at varying rates.

Q. Do you have that chart here?

A. I don't believe that it is here, Mr. Hart.

Q. One of the boys has just handed me this chart. Is this the chart you are talking about, Doctor, the one we have here?

A. Yes, sir, that is it.

Mr. Hart: First I would like to have it marked, please, as Defendants' Exhibit No. 1.

(Thereupon the chart above referred to was marked as Defendants' Exhibit No. 1.)

Q. Now, Doctor, I want to get you to explain this chart and its significance, briefly, to the Court if you will, and perhaps if you will come over here and stand by it you can do it better than you can from the witness stand.

A. On this chart we have applied as a function of time the rate of production at different pressure intervals—[fol. 447] between different pressure intervals—that is, the average rate of production. The average bottom hole pressure is shown, as is shown by these different bottom hole pressure surfaces shown in the upper of these graphs. The number of wells in the field is also shown on this chart, and the cumulative oil production is shown.

Q. All right, sir. Now, does that—beginning with what were or what time does the chart begin, over there on the lefthand side?

A. The chart begins in June of 1933.

Q. All right. Now, the top line then shows the bottom hole pressure—the average bottom hole pressure of the field at the various dates shown on the chart, is that correct?

A. Yes, sir, that is correct.

Q. All right. Now, what does the bottom line there show?

A. The heavy line here shows the average daily production in these intervals between each pressure surface.

Q. Is there anything on the chart which shows the total production of oil during the time shown on the map?

A. Yes, the dotted line on the chart. Here, this red dotted line shows the cumulative production as estimated by the Bureau of Mines.

Q. Now, what does the chart there show to be the average bottom hole pressure in the field at this time?

A. The average bottom hole pressure as of February 8, 1940 shows 106.32 pounds per square inch.

Q. Has that chart been brought up to date as the—with respect to the total production from the field to date?

A. The cumulative production on this chart was brought up only until the end of 1938.

Q. Now, according to the figure on that chart at the [fol. 448] present time, how high, expressed in number of pounds per square inch, is the average bottom hole pressure in the East Texas Field above the saturation point at 750 pounds?

A. The average pressure is approximately 300 pounds per square inch above the average saturation pressure.

Q. Doctor, before we take that down, is there any other explanation you care to make about that chart?

A. This chart does show that producing at high rates of flow will, at least for a time, cause a drop in the bottom hole pressure; and similarly, if the field had been produced for a time at high rates, when the rate is changed to a lower rate the bottom hole pressure will increase. For example, during August the field was shut in for fifteen days, and during those fifteen days the bottom hole pressure increased some forty-three per square inch.

Judge Allred: Will you indicate that on your chart?

A. Yes. It varies here, and at various times when we have reduced the rate of production, and it shows that it does cause, at least for a time, an increase in the bottom hole pressure. And similarly, an abrupt increase will cause for a time a decrease. We do know that at constant rates of production, why, you may get a rapid decrease in the bottom hole pressure. It does tend to level off, but at a lower value, if you produce at a higher rate. As for example, after we opened the field up after the fifteen day shut down the bottom hole pressure decreased very rapidly at first, and it has come up here to level off at a value of about 1,063 pounds per square inch, as shown in the last part of this chart.

Q. Doctor, then assume a continued maintenance by the Railroad Commission of substantially the same top allowable as in the present order. With that assumption, in [fol. 449] your opinion, is there any reasonable danger that at any time soon the bottom hole pressure will decrease throughout the field so as to cause any appreciable amount of physical waste of oil?

A. I wish that I could answer that question very definitely, Mr. Hart, and I think I can if I may use this other chart.

Mr. Hart: Very well. We will ask that that be marked Defendant's Exhibit 2.

A. The principal problem which we have confronting us at the present time with reference to the maintenance of bottom hole pressure in the East Texas field is the amount of water which is being produced and the rate at which water production is increasing. At the time we made these calculations which are shown on this chart the water pro-

duction had been increasing for a period of some two or three years in a semi-logarithmatic manner, or what appeared to be that, and on the basis of that data, and we extrapolated that data and we got on a semi-logarithmatic paper several years into the future. Now, several years ago, I believe it was 1936, an article was published in which there was given a mathematical relationship which did relate to the rate of production, the total production, from the East Texas field, and the average bottom hole pressure. Two such equations were developed about the same time, one by Hurst of the Humble Oil & Refining Company and the other by Muscrat of the Gulf Research Development. Both of these equations were based on the assumption that the water drive in the East Texas field was due to the expansibility of the water in the great Woodbine reservoir. Calculations which have been made using this equation over a period of several years have shown that the equation, that is, the bottom hole pressure that is calculated by [fol. 450] this equation, did check very closely; so it appears that knowing what data to put into the equation, it is possible to predict very accurately what will happen in the future. The difficulty which we have now, however, is determining what data to put in the equation. In the future on this chart here I have shown a relationship between bottom hole pressure and time at different rates of production. These calculations were made, incidentally, in November of 1938. They show the relationship between the bottom hole pressure and the time at a rate of production from the field of 2,660,000 barrels of oil per day. We have also calculated in the same relationship at a rate of 380,000 barrels of oil per day. Assuming that the water production did increase in accordance with the trend which it had shown up to that time, a similar curve was calculated at a rate of 432,000 barrels per day, assuming that the water production continued to increase as it had at that time. We also calculated the relationship between the bottom hole pressure and time, assuming—or at a rate of 432,000 barrels per day—assuming all of the water produced with the oil in the field was reinjected into the reservoir; that is this upper curve which I have shown here. Briefly, these curves show that at a rate of 2,660,000 barrels per day the average bottom hole pressure would have dropped to 750 pounds per square inch in about forty-five days at a rate of 380,000 barrels per day. Assuming that the water

production increased along the same trend, the average bottom hole pressure would have dropped to the same value by about January of 1940, and at a rate of——

Q. You said 1940. Did you mean 1944?

A. 1944, excuse me. And at a rate of 432,000 barrels per day, if the water production continued to increase and none of it was reinjected, the curve indicates that the aver-
[fol. 451] age bottom hole pressure would drop to 750 pounds in the middle of 1943. On the other hand, if all of the water were reinjected in the middle of 1943, the average bottom hole pressure would have been as high as it was at the time these calculations were made, or slightly higher in fact.

Q. About what is the average daily production, total production, from the East Texas field under the present proration order?

A. The daily average is about 400,000 barrels per day, or slightly over that.

Q. That is considering the shut down?

A. Yes, sir. And, incidentally, the estimated bottom hole pressure which we did estimate at that time, that was a year and three months ago, would be between these two curves here, and that would be a value slightly less than 1,070 pounds per square inch. Our present value is 1,063. So in a period of that time it has indicated we are following the trend indicated between these two lines.

Q. Doctor, at the present time could you or not answer this question: Is there any physical waste being caused in the East Texas field by reason of the maintenance of the top allowable at the figure at which it is now being maintained by the Commission?

A. Insofar as the pressure is concerned, I do not believe that there is any material waste caused by the maintenance of the top allowable at its present value.

Q. Now, you said that there are certain factors that are unknown as to the future that might influence the determination of how much total production of oil could be allocated without bottom hole pressures going down to the saturation point. Now, you mentioned the matter of the water production and the reinjection of water. Now, would
[fol. 452] you state the facts briefly about that to the Court? And what efforts the Commission made to put water back into the reservoir?

A. The efforts which are being made, I think, perhaps, the operators should be given more credit for that than the Commission, because there have been a number of experimental water injection wells that have been drilled in the field. At this time there are some fifteen or twenty. They have a capacity up to more than 3,000 barrels of water per day. It is estimated at the present time that it would take between fifty and seventy-five water injection wells to return all of the salt water currently being produced into the Woodbine reservoir. I say it is uncertain, because we don't know how much will be returned to the reservoir.

Q. Assuming that the water that is produced can be returned to the reservoir, or substantially all of it or a large part of it, would it be possible to produce the field at the present top allowable of oil and not have the bottom hole pressure decline from an average of 750 pounds per square inch for many years in the future?

A. You mean the present daily average oil production?

Q. Yes, sir.

A. Yes, sir, our calculations show that definitely, that the bottom hole pressure could be maintained at approximately the present value for six or seven years more in the future; certainly that long, if all the water were reinjected.

Q. Well, based on your facts as to what is being done, what is your opinion as to whether or not the field can be—the top allowable can be maintained at approximately the present figure without causing any physical waste in the East Texas oil field for several years?

A. I can't answer that question definitely because of the [fol. 453] reasons that I have indicated. I will say this, and possibly this might throw a little further light on the matter—do you want to introduce this?

Q. Which plat do you want?

A. This one.

Q. What map are you now pointing to, Doctor?

A. The chart or map that I am pointing to is a combination of the Railroad Commission's sand thickness map over which has been superimposed a bottom hole pressure map, showing the bottom hole pressure contours in the field. These bottom hole pressures were calculated to the face of the sand to give the actual pressure in the reservoir.

Mr. Hart: I ask that this chart be marked Defendant's Exhibit 3.

Q. Now, referring to that map you have described, and which has been marked Defendant's Exhibit 3, explain what is shown on that map.

A. This map shows that only in the area that is at the bottom here has the pressure dropped below the saturation pressure. They developed a small area down in the southeastern corner of the field that is the only appreciable area in the field where the pressure has dropped to the saturation pressure. That area, incidentally, is one in which the sands are of low permeability, and for that reason the pressure is not replenished from the water drive on the west as well as it is in other parts of the field. The pressure contours across the field show that the pressure of course is highest on the west and lowest on the east. The minimum pressure on the east is in the neighborhood of 900 to 950 pounds per square inch. Now, we have determined by measuring the volume of oil saturated sand as indicated by this sand thickness map with these various pressure contours, [fol. 454] what the volume of oil saturated sand is at the present time at varying pressures below 760 pounds, and in 20 pounds per square inch intervals on up, and from that assumption—we think that it is a reasonable assumption because of our experience in the past few years—that the pressure gradients across the field all remain essentially constant in that portion of the field where gas has not come out of solution, even though the pressure on the field as a whole declines, we have constructed this chart which is shown here.

Mr. Hart: We want to have that marked Defendant's Exhibit 4.

Q. Doctor, explain what that chart shows, please, Defendant's Exhibit 4, briefly.

A. This chart shows the relationship between the average bottom hole pressure as determined by our ninety-one key wells and the per cent of the original oil saturated sand below 760 pounds per square inch. It shows that at the present time we estimate that something like 1.4 per cent of the original oil saturated sand has now declined below 760 pounds per square inch. Now, the saturation in that area is just slightly below that, and it shows that even though the bottom hole pressure in the field has declined from 1,625 pounds to its present figure, only 1.4 per cent of the field has dropped below the saturation pressure and only 1.4 per cent

has gas beginning to come out of solution. It also shows that when the pressure does drop somewhere in the neighborhood of 850 pounds per square inch then a further decline in the bottom hole pressure will cause rapidly increasing amounts of gas to come out of solution in the field. This field, incidentally, is different from any of the other major oil fields that I know of in the state in that it is considerably under-saturated. In the normal oil field when the pres- [fol. 455] sure drops below the original pressure gas begins to come out of solution all over the field. Some gas comes out of solution, but in this field it is only in the extreme east that it has come out at the present time.

Q. Doctor, what is your opinion as to whether or not there will be any physical waste as long as the bottom hole pressure in the field is kept above the saturation pressure?

A. There will be no change in the physical properties of the oil so long as the bottom hole pressure in essentially all of the field is maintained above the saturation pressure, and for that reason there would be no physical waste caused by the decline in pressure.

Q. And you stated about how many pounds above that saturation pressure is the average bottom hole pressure at this time?

A. The average bottom hole pressure is 300 pounds per square inch above the saturation pressure.

Q. Now, Doctor, I believe Mr. Buck testified something about the method of production which the Commission has adopted of allowing 690,000 barrels, approximately, production on producing days and then having a certain number of shut down days. Now, would you explain how that has worked out with reference to the wells on the west side, and state whether or not in your opinion the method of production which is permitted under the present proration order has caused any waste in that respect?

A. The orders, the shut down orders which have been written for the East Texas field have provided that where it is shown that in order to prevent physical waste it is better to produce the well continuously at reduced rates, permits will be granted to operate the wells in that manner. Most of the wells which make water on the west side are so operated under permits which are granted by agents of the Commission.

[fol. 456] Q. Where it is shown to the Commission that a well that is making water might be lost or waste would

result if it is shut down, has the Commission granted such well the right to produce daily at a reduced figure, which will average up to the same thing they would get if they produced the regular allowable on producing days and shut down on the shut down days?

A. Yes, that is true. The practical problem is this, in some wells that produce a high per cent of water, if they are required to shut down for say a period of a day it is necessary to pump them for some time before any oil is produced from the well. Such wells can best be operated by producing continuously, and permits are given to do that.

Q. Now, Doctor, you are familiar in a general way with the proration order of June, 1939, and the proration orders generally which were in effect prior to the promulgation of the proration order of September 11, 1939?

A. Yes, I am familiar with that.

Q. Do you recall about how much oil was prorated above a twenty barrel per well allowable under the old order on the basis of the factor of potential?

A. My recollection is that it was something between seven and ten thousand barrels per day.

Q. Now, under the order of September 11, 1939, and under subsequent orders, about how much proratable oil has there been to distribute on the basis of the factors which are stated in the proration formula?

A. You mean on the basis of the sand thickness, acreage and potentials?

Q. Sand thickness, acreage, bottom hole pressure and potential.

A. About 176,000 barrels.

[fol. 457] Q. Doctor, what part of the field and what kinds of tracts got the benefit of that increase in the allowable by the application of the present formula of the Railroad Commission?

A. I don't believe I understand quite what you mean by that question, Mr. Hart.

Q. Did or not the larger part of this proratable—this increase in the proratable oil go to the tracts in the center of the field with the thick sands, or did they go to the tracts on the edges of the field with the thin sands?

A. The tracts, or the wells I will say, located on very small tracts or in very thin sand sections where the potentials were low have, on the schedule at the present time, substantially the same allowable as they had under the pre-

vious order. Under the previous order they got twenty barrels. They now get say from twenty-one—from 20.05 to 21 barrels. The wells located on the larger tracts and in the center of the field get considerably higher allowables than they obtained before, ranging up to more than 50 barrels per well.

Q. Under the old proration order what was the maximum allowable per day assigned to any well in the field?

A. I don't recall the exact value. I think it was something on the order of twenty-five or twenty-six barrels.

Q. Under the present order what is the maximum allowable assigned to any well in the field, approximately?

A. It is slightly in excess of fifty barrels.

Q. Has the Railroad Commission prepared a graph which shows the relative method of distribution of the allowable under the old order, that is, the order which was in effect prior to the order of September 11, 1939, and the distribution of the allowable which takes place under the present order?

A. They have, yes, sir.

[fol. 458] Q. Is that the top chart which is shown over there on the board?

A. It is.

Q. Would you go over to that, please, and explain that?

A. Yes, sir.

Mr. Hart: We ask that this be marked Defendant's Exhibit 5.

Q. Doctor, what is the black dashed line on that chart? What does that show?

A. The black dashed line shows, illustrates the distribution of allowable under the August proration schedule of the Commission, the August, 1939, proration schedule.

Q. Under this proration schedule approximately what percentage of the wells got exactly a twenty-barrel allowable per day?

A. This chart does not show the exact number. It was 19,000 some odd wells, or approximately seventy-five per cent.

Q. Of the wells in the field got exactly a twenty barrel margin, is that correct?

A. Yes, sir.

Q. Did they range from wells having one barrel per hour

potential to wells having about 860 or 865 barrels per hour potential?

A. I believe 860 is correct, yes.

Q. Now, under the present order, as contrasted with that, are there any wells that get exactly a twenty barrel allowable?

A. I don't believe there are. If there are it is just two or three wells.

Q. Then under the old order that black line showed that a great percentage of the wells got exactly a twenty barrel allowable and then a comparatively very small percentage got a little above twenty barrels, is that correct?

A. That is correct. This chart shows that eighty-one per cent got between twenty and twenty-one; 7.65 per cent of [fol. 459] the wells got between twenty-one and twenty-two barrels per day; 7.07 of the wells got between twenty-two and twenty-three; 1.26 per cent got between twenty-three and twenty-four; .0035 between twenty-four and twenty-five; .0009 between twenty-five and twenty-six.

Q. What does the red line on that chart show?

A. The red line on the chart shows the distribution of the allowables in the field. That is, the per cent of the total number of wells having allowables in the different brackets from twenty and twenty-one on up to the maximum between fifty-one and fifty-two.

Q. Does that or not show that the allowable is distributed widely between the wells in the field? For example, what percentage does it show of the wells in the field getting an allowable of around forty barrels?

A. An allowable of what?

Q. About forty barrels.

A. About 60.9 of one per cent.

Q. What are some of the percentages there, without reading them all? State that to the Court.

A. Between twenty and twenty-one is 19.02 per cent of the wells; twenty-one and twenty-two is 10.33 per cent; between twenty-two and twenty-three it is 7.51; between twenty-three and twenty-four it is .37; between twenty-four and twenty-five it is——

Q. Doctor, I don't believe it will be necessary to read all of those. Those figures appear on the chart and show the percentage of the wells in the field which received an allowable between those figures as shown on that chart, is that correct?

A. Yes, sir.

Q. Has the Commission prepared another chart which [fol. 460] shows the distribution of the allowable granted to the Humble wells under the new order and the percentage of their wells that fall in the different proration brackets according to so many barrels per day?

A. They have.

Mr. Hart: Will you mark that Defendant's Exhibit 6.

Judge McMillan: Are you going to introduce those in evidence?

Mr. Hart: Yes, sir, I want to introduce all of these in evidence. We now offer all of these exhibits which have been identified up to this time.

(The heretofore identified defendant's exhibits 2, 3, 4, 5, and 6 were thereupon received in evidence.)

Q. Doctor, will you explain what that chart shows, briefly, please?

A. This chart as shown is related to various allowable brackets, that is, one barrel each from twenty up to forty-eight barrels. First, in number of wells operated by the Humble Oil & Refining Company, and second the percentage of the total number of wells falling in that bracket which belonged to the Humble Oil & Refining Company.

Q. Now, Doctor, have you made any study of the field to show what the result would be if the allowable in the East Texas field were allocated to each lease in the field in the proportion of the acre-feet of net effective oil sand under the particular lease to the net effective oil sand in the whole field, as to whether each lease in the field would produce an amount of recoverable oil substantially equivalent to the recoverable oil originally in place between each lease?

A. I have.

[fol. 461] Q. If such a method of allocation was adopted, that is, on the basis of acre-feet underneath the lease as compared with the acre-feet in the whole field, state whether or not each lease in the field would recover substantially the equivalent of the recoverable oil originally in place between such leases?

A. It would not.

Q. Just state why.

A. That would occur in any field, that is, that method of distribution would accomplish that result in any field only

if all of the wells in the field produced for the same length of time and if the number of acre-feet of oil saturated sand underlying each lease depleted the same percentage as that underlying each other lease in the field. In the East Texas field since the water is encroaching from the west, in general the wells on the west will produce a much shorter time than those further east.

Q. All right. Then under the actual conditions in the East Texas field is it true or not that each lease will produce exactly as long as each other lease?

A. Definitely not.

Q. That is definitely not true?

A. Yes, sir.

Q. Is it true that in the East Texas field as it is produced that each lease will contain from one period to the next exactly the same percentage of the acre-feet of oil saturated sand in the field? Do I make myself clear?

A. I am not sure that I understood your question, Mr. Hart.

Q. I understood that you said that a proration on the basis of reserves would permit each lease to recover the equivalent of the recoverable oil originally in place if you [fol. 462] started out and prorated on that basis only if each lease would produce the same length of time and if you assumed that each lease would continue throughout the history of the field the same percentage of the recoverable oil or the same percentage of the acre-feet of sand?

A. That is correct.

Q. Is that second condition true as applied to the East Texas field? Will each lease always have exactly the same percentage of recoverable oil and the same percentage of acre-feet of sand?

A. It will not.

Q. Why is that? Explain that to the Court.

A. Because of the fact that the water drive is coming from the west and in general the wells of the tracts on the west will be depleted much more rapidly in the per cent of the oil contained under them than those further east. Now, wells further to the east now have substantially the same amount of oil underlying the leases that they originally had, whereas some leases to the west are practically if not entirely depleted.

Q. Dr. Patten, let me ask you this: If you go to calculating the number of acre-feet underneath any lease is there a cer-

tain percentage of error that might be expected in making such a calculation?

A. Yes, sir.

Q. Even using the most careful estimates you can use?

A. Yes, sir, there is always some error.

Q. Well, what would be the percentage of error that you might have?

A. I would hesitate to give you an exact figure on that.

Q. Well, if you assume a certain net effective sand are there certain variable factors that would enter into any [fol. 463] calculation of the amount of recoverable oil that would be underneath any tract, and what percentage of error or what chance of error would there be in making any such calculation of recoverable oil?

A. Assuming that you knew the number of acre-feet of oil saturated sand, the other factors which would be involved would include, of course, the porosity of the sand, the per cent of connate water and what may be called a recovery factor for that particular area in the field or that particular field.

Q. Well, assuming, say, net sand, how much might estimates vary, depending on different estimates as to those factors which go into a determination of the recoverable oil after you have once gotten net sand or made your best estimate you can of that?

A. Those all vary as much as other factors which I have mentioned. That is, as much as the porosity per cent will vary.

Q. How much does the per cent of porosity vary?

A. Where?

Q. Say throughout the East Texas field.

A. I couldn't give you definite values on that. I have seen the results of pore analyses taken from the East Texas field which did show in some instances wide variations, on the order of say between nine and ten, and thirty-three per cent in certain instances.

Q. Well, what other variations do you have there, what other factors did you mention, and how much may they vary?

A. Per cent of connate water. I don't know to what extent you can say on the average it does vary throughout the field, although those pore analyses did show some variation in per cent of connate water.

[fol. 464] Q. Now, Doctor, in your opinion, could any formula be devised which would give to leases in the field the exact amount of recoverable oil which was originally in place underneath such leases or which is now in place underneath such leases?

A. No.

Q. Taking into consideration all the leases in the field?

A. Of course, it obviously couldn't be done exactly.

Q. How much off might you be on any formula that you know?

A. I don't know.

Q. Or is it possible to know how much you might be off?

A. You wouldn't know. You would never know how much off you were even after you had produced the field, that is, not definitely, and there is considerable doubt as to how much off you would be when you start because there are so many factors involved. Even assuming that you knew how much recoverable oil was originally in place under each tract, you would have the further difficulty of estimating how long each well will produce and how much oil is going to be produced from the field as a whole. Of course, if we knew how much was going to be produced from the field as a whole, what percentage would be produced—that is contained under each tract, I will say it that way—then it might be accomplished by allowing those wells farther east —farther to the west—to produce until they had produced all of their oil, and then take a row of wells next to them and produce them until they had produced all of their oil, and then take another row and then finally you would get across the field, and if you made a mistake you might have oil left over or somebody might not have it.

Q. I mean under any practical method of proration that would allow any leases to produce currently to some extent, is there any method of proration that would let them re- [fol. 465] cover the amount of oil originally in place or currently in place except the method you spoke of where you shut off the rest of the field?

A. It can't be done exactly.

Q. Doctor, have you studied the tabulation of densities which was prepared, I believe, by Mr. Moore for the Humble and which was introduced in evidence showing the number of wells on tracts drilled to certain densities?

A. Yes, I have looked at that tabulation.

Q. Do you have that tabulation or do you need to refer to it in testifying about it?

A. I don't have that with me, Mr. Hart.

Q. Is it here on the table?

A. Yes, sir.

Q. Would you get it?

A. Yes, sir.

Q. Doctor, is this tabulation that you have here based on the classification of the wells in the field according to certain densities? The one that was made, I believe, by Mr. Moore and introduced in evidence.

A. I believe that is correct.

Q. Now, Doctor, what does that show with reference to the percentage of wells in the East Texas field that are drilled on the very densely drilled tracts?

A. The tabulation shows that between—I believe it is shown here as between .1 and .4 acres per well, and there is 1.40 of the wells in the field, or a total of 360 wells. Between .5 and .99, or 2.03 per cent of the total number of wells or 523 wells. Between 1 and 1.9 is 5.19 per cent of the total. Between 2 and 2.9 there are 8.66 per cent of the wells.

Q. Now, Doctor, if you take all of the wells in the field that are drilled on tracts that have been drilled to a greater [fol. 466] density than one well to three acres, what per cent of the wells in the field are drilled to a greater density than that?

A. 17.28 per cent.

Q. What percentage of the wells in the field are drilled on tracts where the density is one well to three acres up to one well to 4.9 acres?

A. 28.45 per cent.

Q. And what is the next group there?

A. The next group is from 5 to 6.9, or 38.22 per cent.

Q. Then what percentage of the wells drilled on tracts where the density is one well to seven acres or a less density than that?

A. 16.05 per cent.

Q. Now, what per cent of the wells in the field are drilled on tracts where the density ranges from one well to three acres to one well to seven acres?

A. Almost exactly two-thirds of the field.

Q. What is the average density of drilling in the field, approximately?

A. It is approximately one well to five acres.

Q. Well, now, Doctor, considering the percentages there, I will ask you whether or not the allowance by the Commission of a twenty barrel base or minimum allowable has any substantial effect on the allowable which is assigned to the wells on tracts which are less densely drilled?

A. Of course, it has some effect on those allowables, the wells that are less densely drilled. However, the giving of an allowable of twenty barrels to wells on very small tracts does not have any great effect on the allowables for the other wells because there are so few of those wells, comparatively speaking, on very small tracts.

Q. I believe the testimony shows in this case that the [fol. 467] Humble has drilled to a density of about one well to 5.7, or eight-tenths of an acre. Now, of course, examples could be found in the field where Humble leases are drilled to a much greater density than that, could they not?

A. Yes, there are some of them.

Q. And leases of other operators that are drilled say one well to eight or nine acres?

A. Yes.

Q. In cases where you would find that you would find the same discrepancies between what the Humble and other operators are getting as has been shown by the specific examples shown by the plaintiffs, isn't that true?

A. I don't recall any example.

Q. They showed examples where that was true?

A. Yes, sir.

Q. That same proposition works against the Humble just like it works in favor of everybody else, doesn't it?

A. I imagine it would, although I haven't investigated that particular thing.

Q. Now, Doctor, under a method of allocation which would be based on the acre-feet of sand under a lease as compared with the acre-feet of sand under the field as a whole, what would be the result of the application of a formula like that as to the percentage of the recoverable oil that would be recovered by wells on the west side of the field?

A. They would get considerably less oil, they would recover considerably less oil than they originally had under those tracts.

Q. Well, now, what effect does the allowance of a twenty barrel base or minimum allowable by the Railroad Com-

mission have toward correcting any inequity that might be done to the west side by reason of the time element and the [fol. 468] fact those leases would go out sooner than those lease- to the east of them?

A. I assume what you mean by inequity is if an operator does not recover the amount of oil equivalent to that which originally he had under his tract, is that correct, Mr. Hart?

Q. Yes, sir, that is what I meant to say.

A. In order for wells on the west side, the extreme west side of the field, to recover an amount of oil substantially equivalent to that which they originally had underlying their leases, it is necessary that they produce at rates substantially greater than is in proportion to the amount of oil originally under the tract as compared with those to the east, and the giving of a twenty barrel minimum to such wells will in part at least counteract the shorter producing life of those wells.

Q. Now, what about the operation of the marginal or minimum allowable given—I don't mean the marginal, but the base, or minimum allowable, to these wells on the east side. Is there any factor to be considered in there with reference to those wells on the east side?

A. I don't know that I quite understand the meaning of your question.

Q. Well, you spoke of bottom hole pressure, as—and the formation of a gas cap in a certain portion of the field on the south side, and due to physical facts, is there anything with reference to the possible productive life of the leases on the east side, and the necessity that they might have 20 barrel minimum or base allowable at this time?

A. Well, if the bottom hole pressure in the field does [fol. 469] decrease substantially, to such an extent that a substantial quantity of gas comes out of solution in the reservoir, I believe from our experience in other fields that a gas cap will form along the east edge of the field. The effect of that gas cap, of course, would be to push some of the oil slightly down structure.

Q. Well, what would the result of that be as to the productive life, or the length of the productive life of the leases on the east side of the field?

A. It would decrease the productive life of the leases on the extreme east side of the field, if the probable pressure did decline sufficiently that the gas cap was formed.

Q. Do you recall that a certain questionnaire was sent out to the Humble Oil & Refining Company with reference to its leases back in August of last year?

A. Yes, sir, that is correct.

Q. Did that questionnaire show certain leases of the Humble Oil & Refining Company under which the Humble stated that they had the same number of acre-feet of sand as originally, and other leases where they claimed to have a depletion in acre-feet of sand under their leases?

A. Yes, sir, in their answer to the questionnaire, they did give, as I recall, the original number of acre-feet of saturated sand under the lease, and at present.

Q. Do you have a map here which was prepared by the Commission showing the leases of the Humble, which according to the information given in reply to your questionnaire, shows the leases under which no depletion had taken place, and the leases under which they claimed to have had some depletion in acre-feet, up to the present time?

A. Yes, sir, that is correct.

Q. That is the map which has been put up on the board there, showing the leases in light green, and in dark green. [fol. 470] A. That is correct.

Q. We want to offer that. That will be defendants' Exhibit No. 7.

(Thereupon said map was admitted in evidence as Defendants' Exhibit No. 7.)

Q. Doctor, would you explain what map shows, please, sir.

A. I believe, Mr. Hart, you have pretty well explained it already.

Judge Allred: We don't know what the dark green stands for and what the light green stands for.

A. The dark green shows those leases which in reply to the questionnaire the Humble Oil & Refining Co. stated that they had the same number of acre-feet of oil saturated sand under those acres at the present time that they had originally. The light green are the leases where there was less oil saturated sand underlying the leases than there was originally.

Judge Sibley: Due to the invasion of water?

A. Yes, sir.

Judge Allred: Have you figured out the percentage on that, Doctor?

A. I don't have that figure, as to what the acreage is, at this time. I can supply it to you, though.

By Mr. Hart:

Q. Now, Doctor, do you have a tabulation which was made by you, or under your direction of the—showing the Humble leases in the East Texas Field, showing their acreage and the potentials of the wells on each lease, and the allowable for each lease; do you have that tabulation?

A. Yes, I have such a tabulation made.

Q. Do you have it here where it can be introduced?

A. Yes, I believe I do. I don't have it with me here.

Q. I wonder, if the Court please, if we could have a few [fol. 471] minutes, so that we could get these different tabulations together?

Judge Sibley: All right, sir, we will stop five or ten minutes.

(Thereupon Court was recessed at 3:30 P. M. until 3:40 P. M., at which time the following proceedings were had:)

By Mr. Hart:

Q. Dr. Patten, I believe I had just asked you whether or not the computation had been made by you showing the leases of the Humble Oil & Refining Co. in the East Texas Field, the number of acres in each of those leases, the total allowables for the wells on those leases. Have you made up a tabulation of that Kind?

A. A tabulation of that kind was made under my direction.

Q. All right, sir. Now, I will ask you to hand that to the Reporter so that it can be marked as an Exhibit, please, sir.

(Thereupon said instrument was marked as Defendants' Exhibit No. 8.)

Q. Doctor, I won't ask you to go into every lease on that, but does that show at the end of the tabulation the total number of acres in the Humble leases in the East Texas Field?

A. Yes, sir, it does.

Q. What is that acreage, according to your tabulation?

A. It shows a total on the Humble leases of 14,578.72 acres.

Q. And what does it show there also there beneath that, the total acreage in the East Texas Field?

A. This tabulation shows 132,011.83.

Q. What percentage of the total acreage in the field is comprised in the Humble Oil & Refining Company's leases?

A. 11.04%.

[fol. 472] Q. What is the total of the potentials on the wells in the leases of the Humble Oil & Refining Co. in the East Texas Field?

A. The total potential of the wells of the Humble Oil & Refining Company leases is 1,841,224.

Q. What is the total of the potentials of all of the wells in the East Texas Field?

A. 15,794,503.

Q. What percentage of the total potential of all of the wells in the field is represented by the total potential of all of the wells on the Humble Oil & Refining Company leases?

A. 11.66.

Q. According to that tabulation, what is the total daily allowable for all of the wells on all of the leases of the Humble Oil & Refining Co. in the East Texas Field?

A. 76,593.71 barrels.

Q. And what is the total allowable, daily allowable for all of the wells in the East Texas Field?

A. 690,109.36 barrels.

Q. If the field were prorated exclusively on an acreage basis without any minimum or base allowable would or not the Humble be getting more or less than they are getting under the present formula?

A. They would, according to that tabulation get slightly more—I beg your pardon—slightly less.

Q. That is even if there were no base or minimum allowable whatever?

A. That is correct.

Q. If it were a straight potential order, that is, if you would eliminate a marginal or minimum allowable at all, and prorate it just purely on the potentials of the wells, would or not the Humble Oil & Refining Company be getting [fol. 473] substantially the same daily allowable that they are now getting under the present proration formula?

A. They would get slightly more under those conditions than they are getting now, a difference of .56 of a per cent.

Q. We offer in evidence that tabulation, if the Court please.

(Thereupon said tabulation was admitted in evidence as Defendants' Exhibit No. 8.)

Judge Sibley: Dr. Patten, this first column is surface acres, and not acre-feet?

A. That is correct.

Q. Doctor, there has been some evidence here about wells producing salt water. Have you made up a tabulation of the wells producing salt water in the East Texas Field, grouped according to the percentage of salt water produced, and showing the number of wells in each one of those groups, and the total number of wells producing salt water in the East Texas Field?

A. Yes, sir, such a tabulation has been made under my direction.

Q. I will ask that that tabulation be marked as Defendants' Exhibit No. 9.

(Thereupon said tabulation was marked Defendants' Exhibit No. 9.)

Q. Doctor, I don't care for you to go through all of those percentages. I will just ask you this. What is the total number of wells in the East Texas Field at the present time producing salt water?

A. In accordance with this report, which was as of November, 1939, there were 4,422 wells.

Q. Where are those wells located, Dr. Patten?

A. In general, they are on the western edge of the field.

Q. What could you say about the producing life of those wells as compared with other wells in other portions of the field?

[fol. 474] A. They can be expected to produce a much shorter time than the average well in the field.

Q. We offer that tabulation in evidence, and we also wish to offer in evidence the tabulation which Dr. Patten has already testified about showing the percentage of the wells falling in the various density classifications. I think the Reporter has a copy of it.

(Thereupon said tabulation just testified to by the witness was admitted in evidence as Defendants' Exhibit No.

9, and said tabulation last referred to above was admitted in evidence as Defendants' Exhibit No. 10.)

Q. Doctor, do you know anything about how many wells have been abandoned on the western side of the field?

A. I don't have the exact figure, but as I recall, something in the neighborhood of two or three hundred wells, possibly a little more than that.

Q. A well that is pumping 95% salt water now, how long is it liable to run, according to past experience?

A. I couldn't answer that question very definitely. They don't ordinarily produce a very long period of time after they are making 95% water, and particularly when—since the allowables are reduced to what they are at the present time, which amounts to 11.7 barrels, they don't produce very long.

Judge Sibley: Would it be years or months?

A. Well, it would be a matter of a number of months.

Judge Sibley: I want to ask one other question just for my information; not that it has got anything to do with the case much. When you return this salt water to the sands, will the weight of the column carry it down, or will you have to force it down?

[fol. 475] A. The weight of the column carries it down, for this reason. The normal pressure in the East—I will say the East Texas Field originally, was normal, and originally the pressure was 1,625 pounds. The pressure on the west side, where water is being returned, is usually about 1,150 pounds per square inch, so there is 500 pounds per square inch differential.

Judge Sibley: You only return it, I suppose, after the well is already drowned out?

A. We grant permits to people only after a hearing on each individual well, and we do require that casing or liner be set so that the water is returned below a shale break, so that by the time the water does strike the oil-gas contact it will have to move several thousand feet from the well.

Judge Sibley: That is all.

Judge McMillan: Talking about wells producing 95% water, isn't it wasteful production, taking all of that water out of the reserve, reservoir, to produce that little oil?

A. From the standpoint of maintenance of bottom hole pressure, it is.

Judge McMillan: Those wells that are producing so much water are not being really produced, are they?

A. It is difficult to answer that question definitely, because there are two factors that somewhat counteract it. The production of that much water does have an appreciable effect on the bottom hole pressure. On the other hand, there are local traps in the field, and when wells are abandoned, some of that oil in some instances certainly will be trapped and not recovered by other wells, and in other instances, it will be recovered by other wells, in substantial proportion of it.

[fol. 476] By Mr. Hart:

Q. Doctor, if a man has a well like that, and he isn't allowed to produce it, he just won't get the oil?

A. He just doesn't get the oil. Somebody else gets it.

Q. If anybody gets it at all, it will be somebody else?

A. Yes, sir.

Q. You spoke of shale breaks in reply to a question by Judge Sibley about just—when you re-inject the water, making them put it down below a shale break, if the water comes in contact with the oil, it will have to do it some thousand feet distant. Are the shale breaks of some distance in the field, or are they just of local character?

A. From the information I have been able to obtain, some of those shale breaks do extend over a considerable distance. Others are small lineal shale breaks.

Q. I believe that is all.

Cross-examination.

Questions by Mr. Moody:

Q. Dr. Patten, this system of allowing 690,000 barrels to the field per day, and allowing the field to produce four days a week, is that 690,000 barrels of oil, or 690,000 barrels of fluid?

A. That is oil.

Q. Do you know approximately how many barrels of fluid are produced in the field in a day to obtain 690,000 barrels of oil?

A. The last report which we have on that shows as of November 29th, showed 200,000, approximately 200,000 barrels of water being produced per day from the field. That is, per producing day.

Q. Then, that would mean that in your production, in the production of that field, the days that the field produces, it is actually producing, then, about somewhere in the neigh-
[fol. 477] borhood of 890 to 900,000 barrels of fluid?

A. No, that isn't true, Mr. Moody, for this reason, that all of these wells, or practically all of them which produce any appreciable amount of water, have received permission to produce that oil over the 30 or 31 days of the month, and reduce the rate of production, so that it won't exceed the allowable for the month, and so that means the oil which they produce and the water which they produce is actually produced continuously over the month, or practically so.

Q. If you spread out the 690,000 barrels of oil per day for four days in the week, that is the number of days they are allowed to produce in the week at the present time, is it not?

A. Yes, approximately.

Q. If you spread that out to the basis of seven days, and multiply the 690 by four and divide by seven, it means you average about 400,000 barrels of oil a day, doesn't it?

A. Yes, sir.

Q. Then, if—of course, these wells that produce quantities of water and some oil, they are producing seven days a week, then, and when you say you get about 200 barrels of—200,000 barrels of water a day, you mean by that, do you not, that you get that 200,000 barrels of water per day for seven days a week?

A. No. Perhaps I didn't make myself clear on that. That 200,000 barrels was calculated on the basis of allowable on producing days.

Q. I see.

A. I might explain the type of questionnaire we send out, and how the figure is arrived at. We ask the operator what percentage of water his well is producing, and how many
[fol. 478] barrels it is producing, and that number of barrels is always calculated on the basis of the allowable. That is, if a well has an allowable, say, on the schedule, of 20 barrels, and it is producing 50 per cent water, then we estimate that on a producing day, per producing day, he would be producing 20 barrels of oil. Actually, he may produce the

well continuously at the rate of 11.7 barrels of oil per day, and 11.7 barrels of water per day.

Q. Dr. Patten, give me that figure, if you can, please, sir, based on a four-day week, producing the field, which would mean to bring the water production back to the four-day period, or put it on a weekly basis. Can you tell me about how many barrels of fluid are taken out of the reservoir daily on a four-day week basis, or state it the other way, daily on a seven-day a week basis?

A. I see what you are getting at.

Q. That is what I am driving at, yes, sir.

A. On a seven day basis, it would amount to—that is, in barrels measured at the surface, a total of about 530,000 barrels per day. I believe that is an answer to your question.

Q. About 530,000 barrels per day?

A. Yes, sir.

Q. That includes the water and the oil?

A. Yes. Now, of course, we should, in order to get the equivalent of the water in terms of oil, we should take into consideration the fact that the oil shrinks in its volume when it comes to the surface; whereas, the water doesn't. One barrel of oil in the ground amounts to approximately eight-tenths of a barrel of oil at the surface, so that would make the figure, converted to the surface, 200,000 barrels of water would amount to 160,000 barrels of oil, as the equivalent to that.

[fol. 479] Q. You are now calculating the water in terms of barrels of oil at the surface?

A. Yes, sir.

Q. But that comes out down in the ground, that water does; it occupies just a little less space, the water does, in the ground, than it does at the surface?

A. Yes, the water remains substantially constant, but the oil shrinks at the surface.

Q. Yes, when the gas passes out of it?

A. Yes, sir.

Q. So, that will be about 530,000 barrels per day for seven days a week that the field produces?

A. Yes, it would be in that order, although we should make the correction I mentioned.

Q. Your chart you had a few minutes ago that showed the shrinkage or decline in bottom hole pressure as oil and water are produced, I believe that was your Exhibit 2, is my recol-

lection of it. It isn't up there now, but you recall the one I refer to?

A. Yes, sir.

Q. That was based, was it not, those figures you had there of 380,000, for example, oil and water, that was based not on just the oil after you have taken away the water that is produced, but that is oil and water together, the 380,000?

A. No, I will have to ask you—I will have to get the chart. (Thereupon, said chart was opened.)

Q. Now, then, not the curve that has the 2,660,000 marked opposite it, but the curve that has 432,000 barrels daily averaged with water, you show that the bottom hole pressure will get to the—below the point of saturation, I think you call it, where the gas passes out of the oil, about the middle of [fol. 480] 1943?

A. Yes, sir.

Q. Now, as a matter of fact, the field is now being produced, is it not, at approximately a hundred thousand barrels of oil and water, on an average, above that 432? You said about 530,000 is being produced now.

A. I had better explain the chart again, Mr. Moody.

Q. All right.

A. The curve which you mentioned there is our estimate of the relationship between the pressure and time, as oil is produced from the field at a rate of 432,000 barrels per day, together with what we estimate to be the amount of water that would be produced along with it.

Q. I see. When you say 432,000 barrels daily, average, with water, you have taken the water out, and you are talking about 432,000 barrels of net oil?

A. Yes, 432,000 barrels of oil, and it may produce 100,000 or two or three of four hundred thousand barrels of water in addition to that. The upper curve there is our estimate of how the bottom hole pressure would vary if no water were produced after November, 1939.

Q. If you didn't produce any water at all and produced 432,000 barrels of oil daily, why, the top line would mark the decline in the bottom hole pressure?

A. That is correct.

Q. This middle line, the heavy one, you have got 380,000 barrels daily average with water?

A. Yes, sir.

Q. Does that mean 380,000 barrels of oil and no water in-

cluded in it, or has the water been taken out of the 380,000 barrels?

A. That is 380,000 barrels of oil.

Q. Without regard to how much water——

[fol. 481] A. And to that will be added—to that 380,000 barrels will be added the volume of water which will be produced, or which we estimated would be produced if that trend was followed.

Q. Let's talk just for a second about the 432,000 barrel curve and the 380,000 barrel curve. How much water was figured as the amount of water produced in calculating that curve?

A. That water varied. I don't have the figures on the amount of water production. I do recall that it checked pretty closely up to the present time with what our reports have shown the water production to be, slightly greater than what we have shown the water production to be, and in 1943 and 1944, as I recall, the water production was up—as estimated on that exhibit, up around seven or eight hundred thousand barrels a day.

Q. That is all, as far as I am concerned.

Judge Sibley: Does that mean that if the lucky leases to the east were to buy the drowned out wells to the west, or hire the fellow to put their water back down, they could hold the water back down.

A. Yes, if all of the salt water produced were returned to the reservoir, the bottom hole pressure would follow that upper line. I might say, we are much more certain of the upper line than we are of the others, because we have the oil being produced, and we have a definite figure there, but the other curves are estimated.

Mr. Moody: I want to ask a few more questions.

Q. That chart proves, does it not, that the production of this water at the present rate is leading to the dissipation of the reservoir pressure or bottom hole pressure?

A. Yes, it is having a very definite effect upon the declining bottom hole pressure.

[fol. 482] Q. And at the present time there is a very small per cent of the water that is being produced put back into the sand; isn't that right?

A. Yes, sir, I would estimate at the present time there is on the order of about 20,000 barrels per day. Within the

past four or five months, there have been, I would say, three-fourths of the permits for water injection wells, have been granted; particularly has that been true since the suit was filed by the Attorney General's Department to prevent the polluting of the Sabine River. We have had a number of applications since that time. It seems to have supplied a very great incentive to do that.

Q. Practically all of that water comes from wells along the west side of the field, does it not?

A. Yes, they are in general along the west side. They are in the western area.

Q. And the part of the field from which that water is being produced, and this reservoir pressure expended would cover considerably less than 10 per cent of the entire area of the field, would it not?

A. I couldn't make an estimate of the acreage. That is because there are some wells making water which are a considerable distance in the field. I have an idea your 10 per cent is somewhat near right.

Q. Those wells making water in the interior of the field are in densely drilled areas ans where there has been a greater taking of oil in proportion than there has generally over the field?

A. I haven't made a detailed investigation of that. I do know that in one or two of those areas that appears to be true, but I think there are wells on sparsely drilled tracts in the field where they are making water.

[fol. 483] Q. That would be a well where they had drilled too deeply into the sand, wouldn't it?

A. That would be one cause of it.

Q. Yes, sir. Here is the map I had in mind. It is the Humble's Exhibit No. 5, I believe. The green area there, I understand, on the western edge of the field, is the area that is—that the water is now under?

A. Yes, sir.

Q. Of course, not all of the wells that are within the green area are producing water at this time; isn't that true?

A. I don't know; I didn't prepare the map.

Q. Do you know where the wells are that are producing the water?

A. I know in general where they are. It looks like—I will say it looks as though it might be substantially correct.

Q. You know, do you not, that in places—now, then, in the places where they are producing water, that are far into the

field, in most instances, isn't it true that those are wells that have been densely—where the area has been densely drilled, where there has been a large production of oil, or else instances in which in completing the well, the well was completed too near to the water-oil contact plane?

A. I might add another point. There are also wells where for some reason or other the water has backed up to wells in an area which are not necessarily drilled. Governor Moody, I haven't investigated that matter sufficient intensely to give you an authoritative answer on it.

Q. All right. I will skip to something else. Dr. Patten, in fixing the field allowable for the East Texas oil field, the market demands, or the demands of the market for oil from that field are taken into consideration, are they not, in fixing [fol. 484] the field allowable?

A. Yes, sir, that is one factor that is taken into consideration.

Q. The Railroad Commission monthly holds a hearing called a state-wide hearing, does it not?

A. That is correct.

Q. And they have some estimate as to the market demand from the East Texas field for oil?

A. That is correct.

Q. And the field allowable is usually a little bit below, or maybe a little above, but right in the close neighborhood of the estimated market demand; isn't that right?

A. Do you mean—referring to that estimated market demand what the nominations are from the field?

Q. I refer to what the Commission determines to be the present market demand for the field.

A. Yes, sir, I would say it is somewhere in that neighborhood.

Q. Maybe some few thousand barrels below or above for that month?

A. Yes, sir.

Q. Now, then, that is a factor, of course, that enters into the fixing of that daily field allowable by the Commission; they consider that?

A. Of course, Governor Moody, I don't fix the allowable for the state. What you are saying is substantially true.

Q. Now, then, in 1935—1938, and for the early part of 1939, and up until the opinion was handed down in the first Rowan & Nichols case, the field allowable was fixed at 522,000 barrels, about, was it not?

A. That was on producing days.

Q. Yes, sir; and it was allowed to produce five days a week; isn't that correct?

A. It varied during that period. I think most of the time [fol. 485] it was five days. Some part of that time it was six days. I don't recall what the exact number was any particular month.

Q. And on that basis, the field produced about—on an average, figuring it on a seven-day week basis, instead of five or six-day week basis, the field produced about 380,000 barrels daily, did it not?

A. Over what period of time?

Q. When it had a field allowable of 522,000 barrels for producing days, that calculated out about 380 or 400,000 barrels per day, figured over a week of seven days?

A. Yes, sir, it was about that, yes, sir.

Q. Now, then, in order to give every well in the field under that plan of proration 20 barrels of oil—those that would make it—and then adding to it, which is up to the biggest well, I believe you said produced about 26 barrels—between 25 and 26—in order to give each well 20 barrels a day you had to hold that thing down to five or six days a week, didn't you?

A. Well, say that again.

Q. Well, in order to make production fit market demand, you could not give every well in the field 20 barrels a day plus the seven to ten barrels that was divided out on the potential factor of 2.32 per cent of the hourly potential,—you could not do that seven days a week and stay within the market demand?

A. If the market demand at that time was 380,000.

Q. Well, can you state to the Court why some weeks you were allowed to produce 522,000 barrels for five days a week, and for other weeks for six days a week 522,000; but never were you allowed to produce seven days a week at 522,000, unless it was to try to fit this thing into the question of mar- [fol. 486] ket demand.

A. Of course, at that time I had very little to do with fixing the allowables in East Texas; but it is my recollection that two factors were considered. One was the pressure history, and it had been established that at high rates of flow bottom hole pressure would decline, and at lower rates of flow it would stay at a higher point; and I think that was

one of the factors considered by the Commission in addition to the market demand.

Q. Now, if there was a market demand per week for 522,000 times five,—that would be about 2,160 thousand barrels of oil. Now, you could not let the field produce that clear through ratable seven days a week and at the same time give every well in the field 20 barrels a day, could you?

A. The market demand was how much?

Q. If there was a market demand for five times 522,000 barrels.

A. Per week?

Q. Yes; market demand per week. You could not produce that quantity of oil over the seven day period, allowing wells to produce the same amount each day for seven days and apply a formula which you then had, which in practical effect was 20 barrels plus 2.32 per cent of the hourly potential of each well?

A. Certainly not. That is just a matter of arithmetic.

Q. At 20 barrels per well you would have over 500,000 barrels of oil, and you had to stop them three days a week to hit that market demand?

A. Yes, sir; it would have to be done that way.

Q. The same way I think is true about this order, isn't it?

[fol. 487] A. What is true?

Judge Allred: Is anybody attacking this order on the ground that the Co: mission took market demand into consideration?

Mr. Moody: I am just about to show that they can't allow them 20 barrels per day and stay within their market demand and that the 20 barrels a day proposition is a matter of making the amount that will be produced fit the market demand rather than one of accomplishing a fair and ratable distribution among the operators in the field of the allowable oil.

Mr. Hart: Governor Moody stated our position is that considering the shut down days and the amount it has been reduced by those days, that that figure of 11.7 barrels is the reasonable minimum below which the Commission cannot safely reduce those wells without causing premature abandonment, waste, and confiscation. With regard to the marginal wells, the Commission contends that the Legislature has not delegated them the power to control the production of marginal wells. We object to this line of questioning on

the grounds that there has been no attack on the statute, which permits the Railroad Commission to consider market demand in determining how much oil should be produced in the State or in any field.

Judge Sibley: There is some constitutional question about that, isn't there?

Mr. Hart: Statute has been upheld by the Courts of Texas as being constitutional, and they have the right to consider market demand on the ground that if they exceed the market demand that the oil will be on the surface and there will be underground waste; and it has also been sustained in the Champion case on the same basis. I don't think there is [fol. 488] any question about their right to consider it.

Judge Sibley: I really wanted to know what underlays this 20 barrels per well structure. I wanted to know what the idea is about it; but I did not feel at liberty to ask this gentleman. You say it is not 20 barrels practically because of the shutdown, but only 11.7 barrels.

Mr. Hart: Yes, sir. We wish to further object on the ground that this witness is not a member of the Commission and cannot testify about what the reasons of the Commission may have been. The order speaks for itself.

Judge Sibley: I will sustain the objection to my own question.

Mr. Hart: I further object on the ground that the reasons or motives of the Commission are immaterial. That the only question is how the order actually operates, and if the order can be reasonably sustained on the ground of prevention of physical waste, and I don't think there is any question about that. I don't think anybody has been attacking this top allowable on the ground that it is too low. The only attack on it is that it might be too much. We believe the order can be sustained on the ground that it prevents physical waste. Whatever the reasons the Commission might have had are immaterial, and certainly this witness can't testify about them.

Mr. Moody: My view about that is this,—I don't know that this witness is in a position to state what was said between members of the Commission at the time they agreed on this thing, and if he were, I don't think I would care to ask him.

Judge Sibley: He said he was not in charge at this time. [fol. 489] Mr. Moody: But I think this witness may give testimony from which the Court can draw its conclusions

about the proposition of this 20 barrels, as well as the effect of the 20 barrels. I may have misunderstood Mr. Hart's pleading, but as I understand his answer in this case it was to the effect that the 20 barrels per day—it is true he does average that 20 barrels out here over a seven day period and I believe gets it down to 11.7 barrels; that that was necessary to prevent confiscation of property and prevent abandonment of wells and prevent the loss of oil ultimately recoverable. If it may please the Court, to my mind under the evidence it is a fiction to say that this is 11.7 barrels per day. Now, is this 20 barrels necessary to give equality between operators in the field, to allow the operators an opportunity to produce their fair share of oil? I think that it has been shown here that when you consider the oil that these operators have in place under their leases, the average of the field, as a matter of production, is about 1300 barrels per 100 acre-feet of sand. Still many are producing many times that amount, and others less than that; and I think the direct testimony of Dr. Patten will show that this business of producing 690,000 barrels a day four days in the week, instead of producing 400,000 barrels is for the purpose of giving to every well on these little tracts, regardless of their size, whether they are on one tenth of an acre, or on ten acres, a flat 20 barrels a day and keeping them in the oil business without regard to how that may affect other operators in the field.

[fol. 490] Judge Sibley: What question is it you want to ask him?

Q. I have asked you about the 522,000 barrels. Now, I want to ask you, so far as this 690,000 barrels is concerned, if it is not necessary in order to make their formula work that has been written on that blackboard of a complicated fraction plus 20 barrels—that in order to make it work, isn't it necessary to hold this 690,000 barrels down to four days a week, and if you don't do it then their order can not be made to apply to the East Texas Field as they now enforce it and stay within the market demand?

A. Will you state that again, Governor Moody.

Q. Dr. Patten, with respect to the 690,000 barrels allowable, now enforced by the Commission and allowed under the present order, and allowed for four days each week in the field, is it necessary to hold the field to the 690,000 barrels for just four days a week, and close it in the other

three days, in order to make the 20 barrels minimum operate and keep the deal within the market demand? In other words, if the market demand for the week is four times 690,000 barrels, and dividing it out over the seven days, and then applying the 20 barrel minimum, won't the minimum itself take up all the market demand?

A. Governor Moody, you are not going to produce but four times 690,000 barrels a week during the week. It is obvious that you could not produce but four days a week.

Q. That is to say, if you produce the 690,000 barrels for four days a week, you produce 690,000 times four?

A. Yes.

Q. If you averaged that out on a seven days a week you have about 400,000 barrels a day?

[fol. 491] A. That is correct.

Q. And if you tried to apply your formula, which is this fraction plus 20 barrels, the 20 barrels take up all the daily allowable?

A. Yes; you would have reduced that 20 barrels to 11.7 barrels to each property the same amount.

Q. You can't give them 20 barrels and produce on a seven day week basis, can you?

A. No; in order to have the same distribution you have now you would have to reduce the minimum allowable to 11.7. Of course, it is true they would get the same amount of oil.

Q. They would get the same amount of oil if you put it at 11.7, and then apply your factor to the difference. If to the remaining oil you apply your factor would each well get the same amount of oil?

A. If the minimum is 11.7 and wells are allowed to produce seven days a week, and the total allowable is set at 400,000, the distribution as between operators would be the same.

Q. Applying your factor to the remainder?

A. That is true.

Q. Now, Dr. Patten, you testified, as I understood you, that the field can not be prorated, in your opinion, so as to allow operators to produce exactly in that proportion that their respective reserves in their several leases has to the total reserves in the field?

A. If you know what the acre-feet of sand is under each lease, you could assign allowables to each well in that proportion.

Q. I was referring to an answer that you gave Mr. Hart. I understood you that it could not be done exactly?

[fol. 492] A. I said you could with giving each operator ultimately an amount of oil equivalent to what he had originally in place. He could not even within 15 or 20 per cent approach that, I believe.

Q. For practical business purposes it is possible, is it not, to estimate the quantity of recoverable oil in place under leases?

A. Such estimates are made.

Q. And it is upon those estimates that properties are sold and money is loaned on property?

A. Yes. Of course, those estimates may vary on the same property by as much as 50 per cent from one time to another.

Q. But in the oil business those estimates are made and people deal on the basis of them, and they are accepted in the oil industry as forming the basis of business transactions in leasing and loaning money, etc.?

A. That is one of the factors which is considered in buying a lease.

Q. In this very formula that is used, you undertook to approximate the quantity of oil under the leases, did you not—the recoverable oil?

A. A thick of the oil saturated sand under each lease, yes, sir; we tried to do that.

Q. Insofar as you attempt to apply the formula—I am talking about that formula of acreage times sand thickness and times other things—insofar as you tried to apply that formula you are endeavoring there, are you not, to fix the production from wells on a basis of reserves under the lease?

A. No; that portion of the formula does not do that,—the portion of the formula which has been referred to as the proratable portion of the oil. If all of the oil was dis-

[fol. 493] tributed under that formula, the wells in the center of the field would get allowables which would be quite appreciably higher than the ratios of their reserves to the reserves of the field. Under that portion of that formula the wells in the center of the field would be favored over what they would have if they were in proportion to their reserves.

Q. Let me ask you this question,—you take the sand thickness times the acreage—the average acreage for wells on

the lease—times bottom hole pressure times potential, over the sum total of all of those factors for every well in the field; and then multiply that fraction into your 176,000, do you not?

A. Yes, sir.

Q. Now, then, isn't that factor or that fraction rather, I will say, that you take, isn't that an attempt to relate the sand thickness and the bottom hole pressure and the potential of one tract of land, let us say, of one acre with one well on it to those factors for the entire field?

A. Yes; it is a relationship between the two. The only point I want to make is this: That in those sections of the field where the sand thickness is greatest, and in general the potential is considerably higher. For example, on the Rowan & Nichols tract, where the sand thickness, I believe, has been testified is about 93 feet, which is somewhat higher than the average for the field, the average potential of those wells is 965 barrels per hour; whereas the average for the field is 605; and so, as far as that portion of the formula is concerned, those wells located as the Rowan & Nichols are, get a larger portion of the allowable than they would get if this were purely on a per acreage basis of sand.

[fol. 494] Q. I understand, but now here,—acre-feet of sand has nothing to do with the amount of recoverable oil under a tract of land?

A. Yes; it does.

Q. The potential of wells has something to do with the amount of recoverable oil under a tract of land, does it not?

A. I would like to have you define what you mean at this time when you say the amount of recoverable oil under a tract.

Q. I will change the question. The potential of a well has something to do with the capacity of a well to produce oil from the sand that it is drilled into?

A. Yes; it has something to do with the rate at which it will produce it.

Q. Now, the bottom hole pressure under a tract, or the bottom hole pressure of a well, has something to do with the ability of that well to produce oil?

A. Yes; it is necessary for there to be sufficient bottom hole pressure in the reservoir to move the oil.

Q. The fraction that you use of acre-feet of sand times potential times bottom hole pressure as the numerator, and the sum total of those factors as applied to all wells in the

field as the denominator, multiplied by 176,000 barrels of proratable oil is an attempt, is it not, to distribute that 176,000 barrels of oil on the basis of the comparative reserves of leases and the capacities of their respective wells to produce oil? Can you answer that question?

A. I cannot answer that "Yes" or "No".

Q. You can't answer it either "Yes" or "No"?

A. I can answer it "Yes" to this extent,—that it does approach that, but in addition to that, those factors have this effect,—that they give a larger portion of the allow-[fol. 495] able to those in the center of the field than they would obtain on the basis of recoverable oil in place, and as between the east and west side they give a little more to the wells on the west than they would to wells of similar sand thickness and acreage on the east.

Q. I think you misunderstood me, Dr. Patten. I am not trying to commit you that it works out in an inequality in the distribution of the 176,000 barrels or that it does not; nor am I trying to commit you to the proposition that that is a good or bad way to do it. What I am getting at is this,—if that particular factor does not attempt to distribute among wells in the field 176,000 barrels in the proportion that the respective wells and their reserves and their capacities to produce bear to those characteristics of the other wells in the field.

A. It does eventually what you say with a modification of that, which I stated.

Q. You add to that the minimum of 20 barrels allowable, do you not?

A. That is correct.

Q. And that is without regard to the capacity of the wells to produce or the reserves on the tract from which the wells are drilled?

A. That is correct.

Q. So then you are basing this daily allowable of 690,000 barrels about one fourth on factors that look to the reserves of leases and the capacity of wells to produce, one as compared with the other, and three fourths on a flat per well basis without any regard to the area that the well drains, the size of the tract it is drilled on or the capacity of that well to produce oil or the reserves of oil under it; that is [fol. 496] correct, isn't it?

A. You stated a number of things there.

Q. The result of it is this, isn't it, Dr. Patten,—that to the extent of one fourth of the field allowable you attempt to distribute that among wells in proportion to their respective reserves and abilities to produce oil, and the other three fourths of the daily field allowable is distributed among wells without any regard whatever to the reserves under the wells or their capacities to produce oil?

A. What you said is essentially true, Governor Moody, that one fourth of it is distributed on the basis of this produce of acreage times pressure times sand thickness times potential times bottom hole pressure, and about three fourths on a per well basis; but I do want to point out this: That this portion which has been called the proratable portion, or the proratable portion of the formula does not directly relate the number of acre-feet of sand of one lease to another. It is modified by these other factors.

Q. Dr. Patten, you said that you thought the production of this quantity of water on the west side leads to some waste. Over on the east side, where this pressure is getting down to the critical point over some of these wells, don't you think that the allowable that those wells are receiving over there is so great that it will reduce the pressures over there? I mean the reservoir pressure to below the critical point where the gas comes out of solution in the oil and leads to waste of oil.

A. I said this,—if those wells over there don't produce and are abandoned, that very appreciable quantities of oil will not be produced from the field if those wells on the east side are abandoned.

[fol. 497] Q. I might be inclined to agree with you on that, but that is not the question I asked you. I asked you whether or not the allowable for these east side wells was not so high that it would likely tend to waste in causing the production to be so high that the gas would pass out of the oil?

A. I don't believe so. Our bottom hole pressure chart will show that, except for this area of low permeability in the southeast corner of the field, that the pressure gradients are essentially constant across the field. The proposition, which you are implying at least, is that wells on the east side and west side should be closed in and the wells in the center should be producing.

Q. No; I am not even suggesting that. I did not mean to create that impression. Let me ask you this question,—

the pressures on the east side are going down, are they not?

A. Yes; on the east side; and the pressures in the field as a whole are going down.

Q. And if the production on the east side were restricted somewhat below what it is now, the tendency would be to hold up those pressures, wouldn't it?

A. Yes; if you restricted the pressure on the wells in the east side, or if you restricted the pressure on the wells in the center, it would help to maintain the pressure on the east side.

Q. With respect to those figures of Mr. Hart which he questioned you about,—that density of drilling—that little sheet you had there of one page—Dr. Patten, have you ever calculated the number of wells that have been drilled in that field on tracts of less than two acres or tracts that have been [fol. 498] drilled to an average density of less than two acres?

A. This figure that has been given here, which I can add up for you—it is approximately 2,000 wells; possibly a little more.

Q. 2,344 it will figure, won't it?

A. Yes; I think so.

Q. Have you ever calculated the sand thickness or the acre-feet of sand under those wells?

A. No; not those particular wells.

Q. We have it here from one of the exhibits as 112,000 acre-feet of sand, with a production of 50,000 barrels of oil per day?

A. Yes, sir.

Q. You are not in position to verify those figures—you have not checked them?

A. No.

Q. Well, Dr. Patten, you recognize, do you not, that the result of that is that those wells are allowed to produce —those densely drilled leases, in the applications of this order are allowed to produce, three or four times as much per hundred acre-feet of sand as the other leases are or the average of the field?

A. Yes, sir; those particular leases are, that is correct.

Q. Now, this Rowan & Nichols tract of land is producing 10.11 barrels per day per 100 acre feet of sand. The average of the field is 13.28, according to our figures, per 100 acre-feet of sand. Would you regard the Rowan & Nichols

lease as very much better than the average of the field, assuming the facts stated here to be true that it has 90 feet of sand, and 1115 pounds bottom hole pressure, and that [fol. 499] those wells of potentials ranging from 960 to 965, and that it is located in the Fairway.

A. Yes; I would consider it to be better, and that it will produce longer and will under the present formula get a higher allowable while producing.

Q. If the Railroad Commission was not in the business, and there was no other regulation agency to regulate the production of oil in the East Texas Field, would you think it was a very desirable piece of property? It would be one of the most productive properties in the field, wouldn't it?

A. Yes, sir; it would.

Mr. Moody: I believe that is all.

Questions by Mr. Baker:

Q. Dr. Patten, I want to ask you two or three questions. Do you believe, that it is advisable to maintain the pressures in the East Texas Field?

A. I believe if it can be done, we should try to recover all of the oil in the field before the pressure has declined to such a point that any large percentage of gas would come out of solution.

Q. Isn't that the reason why the Railroad Commission is maintaining pretty rigidly the top allowable at about the present figure?

A. Yes, sir; that certainly is true.

Q. In order to do that, if the water production were material to increase, it would be necessary to decrease the top allowable production of oil for the field in about the same ration, would it not?

A. If the water production in the field were to increase, [fol. 500] as the data which we used in that calculated curve indicated that it probably would, and no water is returned to the reservoir, the allowable for the field would have to be decreased to such a point that in five or six years it would be producing very little oil and nearly all water.

Q. About 20 per cent of the water is being returned to the reservoir at this time?

A. About 20,000 barrels per day, I think.

Q. Out of approximately 200,000?

A. Yes, sir.

Q. All right. Of course, this returning program is entirely voluntary?

A. It is up to the present time, although the Commission has expressed an interest, and has called one hearing in which they did consider evidence as to the necessity of requiring the return of water to the reservoir.

Q. You think it wise to maintain the top allowable at approximately the present figures?

A. I would say this—if we can do it, we should try to produce the oil in that field without allowing the gas to come out of solution, or at least any appreciable portion of it. Of course, it is not practical to do it without any gas at all coming out of solution.

Q. I want to ask you a question about your chart over here, Defendant's Exhibit No. 5. Will you please state what percentage of those wells received 25 barrels a day or less?

A. I will have to go over to the chart.

Q. You did not add those percentages up?

A. I don't have that. I could approximate it. It appears to be a little over 50 per cent.

[fol. 501] Q. Then, slightly under 50 per cent would produce less than 25 barrels per day?

A. That is correct.

Q. Refer to this other chart, Exhibit No. 6. You show here a graph that indicates an increase in the Humble's allowable for some of its wells.

A. That graph does not show an increase of allowable for Humble's wells. This is a comparison between the number of Humble's wells having these allowables and the total number of wells in the field having those allowables.

Q. That is due to the situation of the Humble's wells on the structure, especially with respect to the Fairway?

A. It is a result of the product of acreage times potential times bottom hole pressure times sand thickness, which is in general larger for the Humble wells than for the field as a whole.

Q. It would be much higher than that, would it not, if you did not have this 20 barrel minimum?

A. Yes, sir; the Humble would get a higher percentage of the allowable in the field, if there was no 20 barrels minimum, I believe.

Q. Dr. Patten, you said that you could not determine the number of acre-feet of sand with absolute accuracy, but don't you think that can be determined with a fair degree of accuracy?

A. Yes; the number of acre-feet can be obtained more accurately than most of the other factors, if you have sufficient information all over the field. There are parts of the field which we frankly have very little control of, as we have had to make a number of adjustments as we gathered further information. Since I first made that map we have had to [fol. 502] make adjustments here and there, and there are a number of those where we still are somewhat undecided about—that is how to interpret it.

Q. The construction of these isopach or sand-thickness maps on the basis of a large amount of data is considered to be about as accurate from the engineering standpoint as many other things that you do in oil fields, isn't it; for instances, determining potentials by contour maps, and determining pressure by contour maps?

A. It won't be as accurate as pressure determinations by contour maps in the East Texas Field, but it will be about the same order of accuracy as the determination of the potentials.

Q. The possible errors in compiling one of these isopach maps is not anything to compare with the differences in allowable for adjoining tracts under the existing order, as for instance, the allowable to one tract of five acres with one well on it and an adjoining tract of five acres with five wells on it?

A. In answer to that question, I would have to ask you what portion of the field. In the western portion of the field you could have an error of 100 per cent or more, that is where the sand is very dense, in determining.

Q. Maybe I did not make my question clear. I mean to take two five-acre tracts, side by side, there on the west side of the Fairway, or the east side, except that in that little margin on the east where the sands are very tight, your differences are very great in allowable where you have two five-acre tracts side by side, one with one well on it, and one [fol. 503] with five wells on it, in the order of one to five, isn't it?

A. I don't believe that it would work out in the Fairway one to five.

Q. Well, or one to three?

A. Assume it was one to three, and in that particular portion of the field, say the Fairway, two adjacent tracts, you could determine the relative sand thickness under those tracts much more accurately than the extent of three to one, that is true.

Q. Would you consider that you could determine the accuracy within a margin of 10 per cent of error?

A. In some instances.

Q. General- speaking?

A. You will find discrepancies much wider than 10 per cent.

Q. I mean in compiling your whole map there?

A. That is in the total figure?

Q. Yes, sir.

A. Of course, I did not make the map, and I couldn't tell you exactly how accurately it is, but I would say the total figure might be off 10 or 15 or 20 per cent.

Mr. Baker: That is all.

Questions by Mr. Moody:

Q. One further question. Dr. Patten, if the Rowan & Nichols Todd A lease was prorated on the basis of the formula without the 20 barrel minimum, it would get substantially more oil than it does get under the present method of applying the order in the field?

A. Yes; it would get more than it is getting at the present time, and more than it would get if it were prorated on the [fol. 504] basis of acre-feet of sand.

Q. And that is because it has bottom hole pressures above the average of the field, and because it also has high potentials above the average of the field?

A. Yes. You see the reason for that happening is that as between two wells in the sand having say constant permeability if the sand thickness in one well is twice as great as the sand thickness in another well, and both wells, completely go through the sand, then the producing ability of the wells, at least as to the sand, will be as two to one. If you have twice as much sand, you will have twice as much potential in addition. Multiplying the two together the result is that portion of the allowable is concentrated more to those wells in the Fairway.

Judge Sibley: It accumulates it?

A. Yes, in the Fairway.

Q. And under openflow, why this tract would have considerable advantage over other parts of the field?

A. You mean produces more oil—yes, more than the average of the field would produce.

Mr. Moody: That is all.

Redirect-examination.

Questions by Mr. Hart:

Q. Dr. Patten, you don't mean that they would produce more oil under open flow than they would be allowed to produce under proration, do you?

A. No; I understood Governor Moody's question to be whether or not they would produce more oil under open flow conditions than the average well under open flow conditions. That possibly is true. I doubt whether they would produce [fol. 505] more oil than they would produce under the proration formula.

Mr. Hart: That is all.

Judge Sibley: We will recess until nine o'clock in the morning.

(Thereupon at 5 o'clock P. M., Thursday, February 15, 1940 the Court recessed until 9 o'clock A. M., Friday, February 16, 1940.)

[fol. 506] Friday, February 16, 1940

Morning Session, 9:00 o'clock

J. S. Hudnall, called as a witness by defendants, having been duly sworn, testified as follows:

Direct examination.

Questions by Mr. Hart:

Q. State your name.
A. J. S. Hudnall.
Q. Where do you live?
A. Tyler, Texas.
Q. What is your business or profession?
A. Petroleum geologist.

Q. Mr. Hudnall, will you state your training in your profession—your education and training?

A. I graduated with a Bachelor of Science degree from the University of Kentucky, and had one year's post-graduate work at the School of Mines, Pennsylvania State College; and one year of post-graduate work at the University of Chicago, majoring in geology and engineering in all the courses and schools.

Q. Have you had practical experience in the practice of your profession as an engineer and geologist since having that academic training and education that you have spoken of?

A. Yes, sir; I have had approximately twenty years' practical experience. The first work I did was with the Kentucky Geological Survey, which survey corresponded to the Conservation Department of the State of Kentucky now; and at that time the work was very largely oil and gas [fol. 507] work. Following three or four years of experience that I had with the Kentucky Geological survey, I did some work for independent operators; and following that I came to Texas in about 1925, and I have been practicing in Texas continuously since that date.

Q. Have you had any experience in connection with the East Texas oil field, and if so, state what that experience has been.

A. I moved to Tyler in January, 1931, and opened an office at that time, and made a complete survey of the field on the ground, and have continuously studied the field progressively since that time, spending some 80 per cent of my time in the last nine years studying that field.

Q. I believe you stated that you live in Tyler?

A. Yes, sir.

Q. Is that in the vicinity of the East Texas field?

A. It is approximately nineteen miles west of the field.

Q. Will you state briefly what information has been available to you—what information you have studied in making your studies and in arriving at the conclusions you have reached about the East Texas field?

A. The first studies I made of the field was to make a map of the field on the ground. Following that and during this time, elevations were run to most of the wells in the field at that time. Following this, detailed records daily were kept on the individual wells as they were completed, and the structure of the field was worked out, the sand conditions

were studied, and water production figures, gas-oil ratios, and, in general, keeping up on the engineering features of the field.

Q. By the way, when was the East Texas field first opened up?

[fol. 508] A. In October, 1930, the first well was completed.

Q. Do you know whether or not there was any proration in the East Texas field at the time it was first opened up?

A. No, sir; there was no proration in that field until May 16, 1931, which was the effective date of the first proration order. It was issued in April, and was effective in May, 1931.

Q. Do you recall when the per well potential order, which was upheld by the Federal Court, went into effect?

A. Yes, sir; April 24, 1933, that order went into effect.

Q. Prior to that date I will ask you if there were intervals of time between 1931 and 1933, when there was no effective proration order and the field was produced substantially wide open?

A. The field reached a production of a little over a million barrels a day in July, 1931. Immediately following that, the field was shut in by the military authorities on August 13, 1931, and stayed shut down until September 5, 1931. At that time it was opened up with a daily allowable per well of 225 barrels.

Q. Do you know whether or not, Mr. Hudnall, it is a generally recognized fact that oil is run in the East Texas field that has been produced in excess of the allowable permitted by the orders of the Railroad Commission?

A. I did not get the latter part of your question.

Q. Is it a generally recognized fact that oil has been produced in the East Texas field in excess of the amount permitted by the orders of the Railroad Commission—what is commonly known as "hot oil"?

A. Yes, sir; that is generally known. Estimates as to that amount range from one hundred to one hundred fifty [fol. 509] million barrels of production in excess of the allowable production during the life of the field.

Q. Do you know how many wells were over in the East Texas field prior to April 24, 1933, which, I believe, is the date of the first effective order upheld by the court?

A. About 9200; that is close to it.

Q. That order which went into effect in April, 1933, was what kind of order?

A. The order that went into effect at that time was a straight per well potential order based upon testing a number of key wells distributed throughout the reservoir, from which key wells the estimated potential of the other individual wells was determined. The order had a minimum allowable of 40 barrels a well at that time.

Q. Then you say there were about how many wells drilled at that time?

A. About 9300, and the top allowable of the field at the time the order was issued was about 650,000, but it climbed up to 815,000 by May.

Q. The excess of the allowable, then, in effect, was distributed on a purely potential basis, wasn't it? That was the one factor considered at that time?

A. Yes, sir; and the wells were given 15 per cent of one hour's potential for their daily production.

Q. How long did the well potential method stay in effect in the East Texas field?

A. Until August, 1939, when the present order took its place.

Q. The order spoken of is the order of September 11, 1939?

A. Yes; but the other one expired in August, and they had a two weeks' shutdown then.

Q. Will you state, in general, whether the new order—that is, the order of September 11, 1939, and subsequent [fol. 510] orders that have been based substantially on that same formula, whether the increase in proratable oil that is distributed under the factors in that formula has gone principally to the wells in the center of the field, wells on the better tracts, or the wells on the poorer tracts?

A. The major portion of it has gone to the tracts with the larger acre-feet of sand and a higher potential, generally speaking, in the middle of the field.

Q. Now, Mr. Hudnall, have you prepared some maps here showing certain features of the East Texas field which you believe to be relevant on the question of the producing life of the various portions of the field and the various leases in the field?

A. Yes, sir; I have prepared such a map.

Q. Are those maps up there on the board?

A. Yes, sir.

Q. They have been marked as Defendants' Exhibits 11, 12, 13, and 14, Defendants' Exhibit No. 11 being on the

right. Have you prepared all these Exhibits Nos. 11 to 14, inclusive?

A. Yes, sir.

Q. And do you believe them to be accurate?

A. Yes, sir; they are substantially accurate.

Mr. Hart: We want to offer all those maps in evidence at this time.

(Thereupon, Defendants' Exhibits 11 to 14, inclusive, above referred to, were received in evidence.)

Q. Will you state whether or not Defendants' Exhibits Nos. 11 and 12 show, each of them, a complete picture of the field, or whether you have to combine the two to get a complete picture?

[fol. 511] A. You have to combine the two.

Q. Explain that.

A. The one on the right is the north half of the field, and the one on the left is the south half of the field. Combining the two, you get a complete picture of the entire field.

Q. Will you step over to the board and explain to the Court the significance of the various colored areas on that map?

A. The black area is the area of the Humble leases.

Q. On the map, Defendants' Exhibit No. 11, has the Rowan & Nichols lease been colored in there to show its location—the Rowan & Nichols Todd "A" lease?

A. Yes; it is colored in brown.

Q. Go ahead and explain what those various colors, in addition to those you have already explained, show there.

A. The map shows the structural contours of the field, and the location of the wells that are making water are shown in the red border on the west side.

Q. Is that shown on Defendants' Exhibit No. 11, too?

A. Yes, sir; both colors correspond. That is, the colors on the two maps are exactly alike. The green color is the area in which the wells are now pumping wells. There are a few scattered pumping wells on the west side of the field outside of the area making water, that are not shown individually; and in addition to that, a very large per cent of all the wells that are making water are pumping wells, but they could not be shown both red and green, so inside the red there should be considerable green, if shown that way.

Q. In order to get the entire pumping area of the field, you would have to combine the red and green areas?

A. That is correct. And in addition to that, there is shown [fol. 512] in a lighter red color the area that has been plugged and abandoned. Those are shown both on the east side and on the west side of the field, and the pink color inside the green are areas where wells have been plugged and abandoned, and also a paler pink, but the same color as before, is on the west side of the field, but does not show up as prominently. Likewise, on Exhibit 1 is shown the plugged and abandoned area in the Gladewater townsite. That is an inset map, which takes up a relatively small portion on the same exhibit shown with the Gladewater, but the inset is a very much enlarged portion of the same map.

Q. Mr. Hudnall, now, will you explain to the Court what that map shows with reference to abandonment in the field, as to what abandonment will be caused by, and where abandonment may be expected in the future, and how the field will be depleted?

A. During the last nine years of the producing life of the field, a certain history has been obtained which serves as a very substantial guide to the future history of the field. During this period there has been 613 wells plugged and abandoned. Approximately 450 of these are on the west side of the field, and the remaining portion on the east side. There are between one-third and one-fourth of the abandonments on the east side, and between two-thirds and three-fourths of the abandonments on the west side of the field; and the location of these wells shows very clearly that they are on the margin of the field; and the usual history is that preceding the time they are plugged and abandoned, they become pumping wells, so that by looking at the green area on the map we can see where the next abandonments are [fol. 513] going to be on the east side of the field; and by looking at the red area on the west side of the field, we can pick out the area where the next plugged and abandoned wells will occur, in general, in the west part of the field.

Q. Mr. Hudnall, explain briefly what causes the abandonments on the west side—what physical facts; and what causes abandonments on the east side?

A. There are two physical features of all oil wells, regardless of where located. The first of these features is that they are drowned out by water; and the other is that they die from the loss of pressure. One of the two of these causes is the cause of the natural abandonment of any oil

well. In general, the history that they go through on the west side of the field is that the wells start out making a small per cent of water, and this percentage of water increases until such time as they become unprofitable to operate. The wells never completely exhaust the oil in either the east side or the west side, but merely decline to where they are unprofitable to operate, and there is still left oil after that abandonment.

Q. Will the water gradually encroach on the western side of the field towards the center?

A. Yes; undoubtedly, there will be progressive encroachment from the west to the east side of the field.

Q. As the water increases, will it be true that the wells in the center of the field will go to making water and go on the pump, just as the wells over on the western edge have done?

A. Yes; that is true with this explanation, that where you have as much as 60 or 80 feet of sand section and the well starts making water, when it has been drilled largely [fol. 514] through this section of sand, it will produce for many years before it goes entirely to water, because the water will have to rise through this entire section before it will entirely flood the well. On the west side the wells will go to water much more quickly, relatively, than in the center, because of the thinner sand section, even though they were both making exactly the same percentage of water at one time.

Q. Have you worked out the percentage of wells in the whole field that are making water or that were making water at the date that map was made?

A. Yes, sir; there are 4,405 wells in the field making water, representing approximately 17 per cent of all the wells in the field.

Q. As of what date is that figure given?

A. As of November, 1939. That data is from the Railroad Commission's water report as of that date.

Q. Do you have the number of wells and the percentage of Humble wells that are making water?

A. Yes, sir, there are 109 Humble wells making water, representing 4.3 per cent of all their wells.

Q. Are any of the Rowan & Nichols wells making water?

A. No, sir; and no wells in that vicinity are making water.

Q. Do you have the number of pumping wells in the field, and the percentage of pumping wells in the field?

A. There are 6,788 pumping wells in the field, representing 26.4 per cent of the total number of wells in the field. The Humble Oil & Refining Company has 267 pumping wells, or 10.5 per cent of their wells are pumpers,—a little less than half of the same percentage that the field has.

Q. Do you have there the figure for the wells abandoned to date in the East Texas field?

[fol. 515] A. Yes, sir; there are 613 wells that have been plugged and abandoned in the East Texas field.

Q. How many wells have been abandoned on the Humble leases to date, according to the information that you have?

A. According to my records, there have been 14. If the Humble wells had been plugged and abandoned in the same rate as those in the whole field, there would be about 260. Humble owns about 10 per cent of the wells in the field, and 10 per cent of the total would be about 260.

Q. Look at Defendants' Exhibit No. 13. State what kind of map that is.

A. That map shows the structural contours of the entire field, and the colored area represents the zones in which the structural contours prevail.

Q. That is contoured on top of the sand?

A. Yes, sir; that is the contour on the top of the Woodbine formation.

Q. On which side of the field are the lowest contours found?

A. The lowest contours are found on the west side of the field where the sub-sea elevation is approximately 3,320; and the highest is on the east side, where the highest is about 3,140. The 3,180 and all the area above 3,180 is shown in red color. The purpose for showing that, within the extreme south end of the field there is another area above that, so that it represents a small part of the field, and it is the area in which most of the wells that have been plugged and abandoned on the east side are located.

Q. Are the sands down in the south and permeable enough so that it can be expected that any oil will migrate to this section from other portions of the field?

A. A very small portion of it will migrate into that. The [fol. 516] fact that you have a red area and a green area coming very close together in the south and clearly shows that that will be the first part of the field, as a whole, that will go out of the picture. That is disregarding the edges of the field and looking at it from a north and south viewpoint,

the south third will go out of development long before the north part will.

Q. Is the Rowan & Nichols lease shown on Defendants' Exhibit No. 13?

A. Yes, sir; the Rowan & Nichols lease is shown in a deep red color in the west part of the survey there, and the map shows that if the water table did rise on a horizontal and continued to rise until the Rowan & Nichols leases were flooded, that there would be approximately 90 per cent of all the field flooded before that occurred.

Q. Is that taken into consideration in the abandonments on the east side?

A. No, sir.

Q. By reason of pressure getting so low that the wells cannot operate?

A. No, sir; that does not take into account any abandonments whatsoever on the east side. If the abandonments were added on the east side, the effect would be to place the area that was last producing at that time in less than 5 per cent of the total field. In other words, 95 per cent as a minimum would be depleted before that area would be flooded with water or die from lack of pressure on that basis.

Q. Of course, none of the Rowan & Nichols wells have been abandoned up to date?

A. No, sir; they have not been abandoned up to date.

[fol. 517] Q. Considering all of the facts you know about the field, in your judgment, and assuming that the present rate of production and the present methods of proration continued in effect, about how long will it be before the Rowan & Nichols wells will be making water?

A. I think it will be——

Mr. Baker: May I ask what he means by "present rate of production"? Does he mean present rate per well?

Mr. Hart: I mean present total daily production from the field—assuming the same average daily production from the field.

Mr. Baker: During all of the balance of the life of the field?

Mr. Hart: From now on, yes, sir.

Mr. Baker: Even when they have one well producing?

Mr. Hart: I think my question is based on the same assumption as yours.

Judge Sibley: It is an untrue and impossible assumption.

Mr. Hart: I was going to make the same assumption that they made, in order to attack their opinions about what is going to happen in the field.

Mr. Baker: We have never assumed that the daily top allowable would be maintained at 690,000 barrels a day or above, except to show a rate of depletion. Now, our assumption has always been if this present order stays in effect during the balance of the producing life of the field, that the wells will severally maintain the same allowable that they severally have under this schedule until they pass out of the picture.

[fol. 518] Judge Sibley: I don't remember whether you proved it or not, but there were some maps that undertook to show how many years it would be before exhaustion took place.

Mr. Baker: That was Mr. Buck who testified about the constant rate.

Judge Sibley: The same assumption was made in the question yesterday. I thought at the time it was an impossible one, but still, it had some illustrative value.

Q. Mr. Hudnall, making that assumption, in your judgment, how long would it be before the Rowan & Nichols wells would be making water?

A. I think it would be at least ten years before the water got under their lease. I have not examined the exact total depth of their wells; but after it got under their leases it would have to rise an additional 100 feet, and at the rate it has been rising in the past, it would take some 50 to 75 years to flood it.

Q. Now, Mr. Hudnall, considering all of these facts that you have stated about the past history of the field as to abandonments and depletions and water encroachment and drop in pressure and all those facts, and considering your experience and study of the field, what would be your opinion as to the relative producing life of the leases of the Humble Oil & Refining Company?

A. The Humble Oil & Refining Company leases will undoubtedly produce considerably longer than the average leases in the field.

Q. What about the producing life of the Rowan & Nichols Todd "A" lease?

A. It, likewise, will produce considerably longer. In fact, [fol. 519] I think that lease will be within the approximate last days of production of the East Texas field. It may be that production will last a little longer immediately to the east or to the west of it, but it will be reasonably close to that lease.

Q. Considering all of the facts that you know about the East Texas field and your study of it, in your opinion, under the present plan of proration, assuming that it will continue in effect, will the Humble Oil & Refining Company be given a reasonable opportunity during the producing life of its leases, to recover an amount of oil substantially the equivalent of the oil now in place under its leases?

A. I think they will.

Q. Considering those same facts, I will ask you whether or not, and making the same assumptions, of the continuance of the present proration order, will the Rowan & Nichols Todd "A" lease with the wells that it has now on it, be given a reasonable opportunity to recover an amount of oil substantially the equivalent of the amount of recoverable oil now in place underneath its leases?

Mr. Moody: I object to that question, because that is not the test that the courts have laid down.

Mr. Hart: What is the test, then?

Mr. Moody: Well, I don't think that is it, and I object to it for that reason.

Judge Sibley: The chief objection to the question is that it asks the witness to decide the case.

Mr. Moody: It is also the issue to be passed on by the Court.

Mr. Hart: They have given their opinion.

Judge Sibley: You could ask him if during the time the [fol. 520] lease will have to go, it will have an opportunity to produce its reserve.

Mr. Hart: To produce an amount of oil substantially equivalent to the amount of recoverable oil underneath the leases.

Judge Sibley: You insist on using a legal formula, that I think is a little objectionable where a Court has to decide according to that very thing. I think it would be better to put simpler questions to an expert. Ask him how long this lease will live, and how much it will produce in that

time under this formula, and whether in the aggregate it would get its fair proportion.

Mr. Hart: I was afraid to use the word "fair".

Judge Sibley: Yes; that does make trouble.

Mr. Moody: A further objection that I want to make to this question and to this line of questions is that an operator in the East Texas field is entitled to a present enjoyment of his property, and except as it may be necessary in order to prevent waste by reasonable exercise of the police power to accomplish that end, the Railroad Commission does not have any right to postpone indefinitely that man's right to enjoy his property.

Judge Sibley: That is a law question, too. You can prove by him whether they were getting their pro rata this year, and he can prove whether he thinks they will get it over a period of time, and the Court will have to decide which theory is right.

Mr. Moody: The point of my objection is that testimony that he can in one hundred years from now, or fifty years from now, or twenty-five years from now, get his part of the oil, I think, is irrelevant and immaterial.

[fol. 521] Judge Sibley: I don't think it is immaterial. This field has a long life, and I think that is a factor to be considered. I believe the statute uses the word "reasonable", doesn't it?

Mr. Hart: Yes, sir, the oil must be prorated among the producers in the field on a reasonable basis.

Judge Sibley: Yes, sir.

Mr. Baker: I object to the question propounded with respect to the Humble's leases' ultimately recovering their share on the same grounds that Governor Moody stated; and on the further ground that he has not clarified his assumption. We cannot tell what he means. He says, "If the present order remains in effect." Does he mean by that that each individual well, as long as it can produce, will continue to be permitted to produce what it is presently producing, or does he mean that regardless of the number of wells will not be allowable for the field remain just exactly the same, which everybody knows is an utter impossibility. Now, I think in all fairness to us, he ought to clarify his question.

Judge Sibley: I think it ought to be clarified probably; but you all have undertaken to do some prophesying through

your witnesses, and now he is entitled to come back with a contrary prophecy.

Mr. Baker: That is correct; but we would like for him to define his terms.

Judge Sibley: I think so; and I don't like these complicated questions that roll it all up in one question and put it up to the witness to decide.

Q. Well, Mr. Hudnall, I believe you have stated as to whether or not the Rowan & Nichols leases will have a long [fol. 522] producing life?

A. Yes, sir; that lease will have a long producing life, any way it is produced.

Q. I believe you said it would be in the neighborhood of that portion of the field where the last production would take place, is that correct?

A. That is correct.

Q. Now, in your judgment, will the amount of oil produced from the Rowan & Nichols lease be or not an amount of oil substantially equivalent to the recoverable oil now in place under that lease?

Mr. Moody: Are you asking that about the Rowan & Nichols lease?

Mr. Hart: Yes, sir.

Mr. Moody: I think that is asking the witness to roll the case up and decide the issue here before the Court, and I object to it. And I furthermore object because it does not state the legal measure of the rights of an operator in the East Texas field.

Judge Sibley: I don't think he has any business in stating a legal measure; but if he means that this lease has a better chance to get its oil out under a proration order like this than the average lease has, I don't see why that cannot be proved.

Q. Answer the question, as put by Judge Sibley, please, sir.

A. I think they have a reasonable chance to do that. You can't figure out to mathematical exactitude just how much any lease will produce. I think it will come within engineering accuracy of what you can estimate it will produce within a few per cent. You can't estimate it any closer than 20 or 25 per cent.

[fol. 523] Q. Considering all the facts, do you think the probabilities are that it will produce more or less?

A. I think the Rowan & Nichols lease will produce approximately that; it may produce some more or some less. I don't think you can estimate exactly what it will produce.

Q. Now, following Governor Moody's suggestion, I will ask you this question. Suppose, Mr. Hudnall, that the field were prorated on the basis which would give to each lease in the field currently as each proration order was written, each month an amount of oil in the proportion that the reserve or the acre-feet under each lease bore to the reserve of acre-feet of net sand under the whole field. Do you understand what I am talking about?

A. Yes.

Q. In other words, suppose we adopt the formula that each time the Commission would have to give each lease a percentage of the allowable proportionate to the acre-feet of net sand under that lease, and suppose a formula like that were adopted from now on, what would be the effect of that as to whether each property in the field would recover an amount of oil equivalent to the amount of recoverable oil in place under the tract, or recover more, or recover less of that?

A. The effect of that would be undoubtedly to give some leases considerably more than they now have, and to take away from others. It can be better illustrated this way—assume a lease has twice the reserves under it as the average of the field, and you currently give it twice the allowable, in proportion to the rest of the field, and that it turns out at the end under those conditions it produced twice as long; it would obviously come out with twice as much oil.

[fol. 524] Judge Sibley: In other words, the time element, you think, ought to be considered?

A. It certainly has to be. Any formula that does not consider that can't possibly give to the leases what they have under them, because that very situation assumes they will all be abandoned at the same time.

Mr. Moody: May it please the Court, Mr. Hart in his question said it was suggested by me, that I have suggested here that properties ought to be allowed to produce in proportion to what they had, but I don't understand that I have said or suggested that the Commission ought to each

month prorate it. I would like for Mr. Hart to take that as his own question. In other words, I don't want to be in the position of letting a charge made in my presence go undenied.

Judge Sibley: Yes, sir, it will be considered that that is Mr. Hart's question.

Q. Suppose they didn't give that percentage each month, but they fixed the percentage now on the basis of the percentage of recoverable reserves, now, and then kept that same percentage from now on. What would your answer be as to how much oil would be produced by the leases in the field as related to the recoverable now in place underneath them?

Mr. Hardwicke: Just a moment. Mr. Baker was busy and didn't hear that. Are you still talking about the Rowan & Nichols lease, or are you talking about everybody?

Mr. Hart: I am talking about the whole field. The order has to be applied to the whole field.

Mr. Hardwicke: Irrespective of the properties on the structure? Any conceivable combination of facts? That is what the question is?

[fol. 525] Mr. Hart: I think the question speaks for itself. Mr. Baker would like to have that question read.

Q. (Reporter reading). "Suppose they didn't give that percentage each month, but they fixed the percentage now on the basis of the percentage of recoverable reserves, now, and then kept that same percentage from now on. What would your answer be as to how much oil would be produced by the leases in the field as related to the recoverable now in place underneath them?"

Mr. Baker: I would like to state the further objection that he doesn't state which lease in the field.

Judge Sibley: He is trying to get the witness to say something about all of them. That can't be true about all of them. Some would profit, and some wouldn't.

Q. Is that your answer?

A. Yes, sir.

Mr. Moody: I object to that because it has no practical application to this case.

Mr. Hart: I think it has a very material application because, as I understand it, some of them are contending——

Judge Sibley: It goes to show that the Commission has a very complicated and difficult problem to handle. Whether they have handled it reasonably or not is, of course, a question. I think you can ask the question. It has been answered.

Mr. Hart: All right, Your Honor, I will go on.

Q. Mr. Hudnall, do you know approximately how many marginal wells, that is, statutory marginal wells, pumping wells, incapable of producing twenty barrels per day, there are in the field now?

[fol. 526] A. Between 500 and 600. I don't believe I have the exact number with me.

Q. I will ask you if those wells are generally located on the edges of the field?

A. Generally they are located on the edge of the field, or at least, in the pumping areas, although some of them are offset by flowing wells.

Q. Now, does the fact that the Commission has permitted those marginal wells to produce each day instead of having to be shut in on shutdown days, does that have any appreciable effect on the recovery of oil by the rest of the wells in the field?

A. It would tend to drain some of the oil where it was offset by wells that had a larger allowable.

Q. Take the leases in the middle of the field like the Rowan & Nichols and Humble leases and Mr. Fischer's lease, would that have any appreciable effect on them?

A. If you consider the field as a whole, the effect would be very small, and the effect that I spoke of would be local, a local effect around the particular well that had the advantage over the other.

Q. Isn't it true that as the field is produced, every well in the field is going to get down to being a marginal well some time or other?

A. Yes, sir, that is the life history of an oil well.

Q. And everybody is going to get the benefit of that eventually if the same method is kept in effect from now on?

A. That is true.

Q. Now, Mr. Hudnall, I believe I will ask you to step down again and make an explanation of Exhibit No. 14, Defendants' Exhibit No. 14.

[fol. 527] A. Yes, sir.

Q. Did you prepare that map, Mr. Hudnall?

A. Yes, sir. It was prepared in my office under my direction.

Q. Now, you have shown on there the red area along the west side of the field and the green area along the east side of the field?

A. Yes, sir.

Q. What are those areas intended to represent?

A. Those areas represent the extensions that have been made to the field since January, 1934. In other words, the field as it was developed in January, 1934, was the white area in between the red and the green, and since that time around the margin of the field there have been drilled these additional wells, and these extensions to the field were made.

Q. That is, it represents an extension in the developed area in the field, is that correct?

A. Yes, in the developed portion of the field. Some of this area was indicated at that time as being productive, but had not at that time been developed.

Q. Approximately how many wells have been drilled in that area during the period of time you have spoken of, which I believe is since January 1, 1934?

A. Approximately 3,550 wells.

Q. Do you know how many acres is represented in those areas?

A. I haven't made the exact calculation by perimeter, but generally it is drilled on about a well to seven or eight acres, and on a density of eight acres it would represent approximately 30,000 acres. There has been somewhere between 25,000 and 30,000 acres added to the periphery of the field since that date.

Q. Have you estimated the average recovery, average [fol. 528] ultimate recovery in barrels of oil from those wells that have been drilled in those areas?

A. In general they run about 30,000 to 40,000 barrels per well. That is about as close as I could make it without going into a detailed calculation on individual wells. That calculation is based upon the fact that this is in the thin section of the field where, in general, it would be from ten feet maximum down to zero thickness, or an average of around five feet.

Judge Sibley: They are all in the water now, pumping wells?

A. Substantially all of them are now the wells that are making water and pumping wells.

Q. Are any of the wells on the east side making water?

A. No, none of the wells on the east side are making any water, that is, any appreciable water. They make a little seepage water. That is not Woodbine water.

Q. Then where they have gone on the pump is due to pressure, not water?

A. Yes, sir, the pressure reached the stage where they will no longer flow.

Q. What will be the ultimate total production from those wells?

A. It will be in the vicinity of 100 to 150 million barrels of oil.

Q. What would you say, Mr. Hudnall, with reference to whether those wells will produce oil or have produced oil which could not have been produced through any other wells and which would have been lost if those wells had not been drilled?

A. I think that if those wells had not been drilled, that a substantial amount of the oil that they will produce would have been lost.

[fol. 529] Q. Now, Mr. Hudnall, is there any relationship between a minimum or base allowable to be assigned to the wells, and those wells that have been drilled in that area and that are producing that oil that you are speaking of?

A. I think to be able to go in and explore and develop and produce from areas like this, that you must have a minimum upon which to operate. Now, in addition to the cost of drilling these wells, there has to be considered the fact that they have drilled 121 dry holes in outlining this area, and these dry holes must be considered as a part of the necessary cost of developing and producing these wells, and that in addition to that there have been 201 already plugged and abandoned that were one time producers.

Q. Considering the shutdown days, what is the average of the base or minimum allowable which is assigned to wells under the present order of the Railroad Commission?

A. Approximately 11.7 barrels daily average over a thirty day period.

Q. What is your judgment as to whether or not there would be premature abandonments if the Railroad Commission—premature abandonments of wells if the Railroad

Commission were to cut down this base or minimum allowable below the figure at which it now is?

A. I think any substantial reduction below this amount would cause premature abandonment of a number of the wells on the west side of the field where they are making a high percentage of water.

Q. If you cut down that base or minimum allowable, would there be any reduction in the expected life of these pumping wells?

A. Yes, sir, they would be abandoned earlier than they [fol. 530] would be with a higher allowable.

Q. Now, have you considered generally—there has been some talk about densely drilled areas in the center of the field where the sands are thick. Do you know whether or not they constitute a large percentage or a relatively small percentage of the leases in the center of the field where the sands are thick?

A. It is relatively small. The areas that are most densely drilled are in the Kilgore townsite, which is on the east side of the field. That is the largest area that is real densely drilled. Then in the London, which is in the middle of the field, there are 200 acres that so far as the 200 acres is concerned, it is more densely drilled than Kilgore townsite, but the Kilgore townsite covers approximately 2,000 acres, that is, Kilgore townsite and the area surrounding it that is affected by the density.

Q. Are there abandonments over there in Kilgore?

A. Quite a number of abandonments east of it; and on the west side of the field the largest densely drilled area is Gladewater townsite, and approximately a third of those wells have been plugged and abandoned.

Q. Generally speaking, Mr. Hudnall, will the densely drilled areas have a shorter producing life than the less densely drilled areas in the same position on the structure?

A. Generally speaking, they will have a shorter life, although if they are out in the middle of the field, there won't be much difference.

Cross-examination.

Questions by Mr. Baker:

Q. Mr. Hudnall, you spoke of the order of May, 1933, I believe?

[fol. 531] A. Yes, sir.

Q. You spoke about a forty barrel minimum under that order?

A. Yes, sir.

Q. Are you sure that it had a forty barrel minimum?

A. Yes, sir.

Q. The marginal well law was a forty barrel law at that time, was it not?

A. That is correct. That was changed, and in June, 1933, it was reduced to twenty barrels. The marginal well law may have been different, but that is the way it was put into effect in the East Texas field.

Q. I believe Mr. Hart spoke of that case, the proration order being upheld in that case. You know it to be a fact, do you not, that that case never was tried on its merits?

A. Yes, sir.

Mr. Hart: I was speaking of the Amazon case. That was tried—yes, sir, that is true; that particular case, Rowan & Nichols case, was not tried on its merits.

Mr. Hardwicke: The Amazon didn't involve distribution.

Mr. Hart: I disagree with you. I think it emphatically did. A potential order was upheld.

Mr. Hardwicke: The case will speak for itself.

Judge Sibley: Yes, sir.

Q. Now, Mr. Hudnall, I believe that you said that under the order of May, 1933, the top allowable was how much?

A. It started out with about 662,000 barrels a day at the time it was issued, and by May it reached 815,000 barrels per day.

Q. 815,000?

A. That is correct.

Q. Now, you said that the per well allowable was forty [fol. 532] barrels, I believe?

A. The minimum. You see, they had a minimum, and then the amount above that was allocated on a potential basis.

Q. Yes, and that was fifteen per cent of the hourly potential, as determined by the Commission?

A. That is correct.

Q. In the contouring methods that you have described?

A. Yes, sir.

Q. Now, I would like for you to make some calculations here in order to find out how much oil was proratable under

that order and how it was distributed. Now, take the case of 800,000 barrels a day, for instance, that allowable. You said there was 9,000 wells in the field?

A. Yes, sir, that is right, a little over 9,000.

Q. How much of that oil would be allocated on a per well basis?

A. 360,000 barrels.

Q. How much would there be left to prorate between the wells?

A. 440,000.

Q. Then what percentage of the oil was proratable under that order?

A. A little over half.

Q. A good deal over half, wasn't it?

A. Fifty-five per cent, sir, to be exact.

Q. Now, will you calculate what a west edge well would get under that order?

A. It would get forty barrels.

Q. Well, let me finish my question, please.

A. Yes, sir.

Q. Assuming that the potential of the well was 400 barrels per hour.

A. Under that assumption, it would get sixty barrels.

[fol. 533] Q. Sixty barrels?

A. Yes, sir.

Q. Now, isn't it a fact that there are and were then west edge wells that had potentials that high?

A. Yes, there were a few that did, that is right.

Q. Now, just a little ways east of the extreme west edge there were a number of them, weren't there; a lot of them?

A. Yes, in portions of the field, that is true. Under that particular contouring, the zero line to potential was not taken as the outer limit of the field. A little later they did change that, and at that time there were no 400 barrel hourly wells on the edge.

Q. Let's consider a well in the fairway with 900 barrels an hour assigned potential. How much would that well have received under that order?

A. 175 barrels.

Q. 175 barrels?

A. Yes, sir.

Q. As against sixty barrels for the well on the west side?

A. That is right.

Q. Assuming that the sand thickness on the west side was ten feet, as against 100 feet in the fairway, why, that would give the fairway proportionately more in comparison with reserves than the present order, would it not?

A. Yes, sir, a little bit more.

Q. Quite a bit more, wouldn't it be?

A. Well, the best well in the fairway now gets about fifty barrels, as compared to twenty on the edge.

Q. Yes.

A. About two and a half to one.

Q. That is not the average, however, for the fairway, is it?

[fol. 534] A. No, that is the best.

Q. What would be about the average of the fairway?

A. I haven't made that detailed calculation. I think it would run about thirty-five barrels a day.

Q. Now, then, figure it on that basis.

A. It is a little less than two to one on that basis, in the ratio of twenty to thirty-five.

Q. Well, it is less. Yes, about one and a half. Now, then, what would your ratio be in the other case?

A. In the other case it was three to one. However, there were very few, if any, wells that actually got 175 barrels under that first formula.

Q. Take east side wells, an east side well that had 260 barrels hourly potential under that order. What would it get?

A. Thirty-three barrels.

Q. Thirty-three barrels?

A. Yes, sir. Wait, I believe I have an error in that.

Q. That is as against 175 barrels per well in the fairway?

Judge Allred: Didn't you make a mistake on that 900 barrel potential? Fifteen per cent, isn't that 135 instead of 175?

A. That is correct. I added forty to that, but there would be no forty. The forty was not added if the well could make it, see? I did add the forty, which should not have been added to that.

Judge Allred: It would be a little better than twice instead of three times, a little more than twice?

A. Yes, sir, in the ratio of sixty to 135.

Q. The east side well will get how much, you say?
A. 27.3 barrels.

Mr. Hart: If the Court please, I don't see how this line [fol. 535] of inquiry is material, unless they are proposing that a potential order——

Judge Sibley: You said that order was held good, and I guess he is trying to show this is different to spoil the authority you cited.
Mr. Hart: All right.

Q. Now, what does the average well on the east side get under the present order?
A. Well, extreme east side wells get a little over twenty barrels.
Q. A litle over twenty barrels?
A. Yes, sir.
Q. What is the proportion there?
A. Well, if you compare that with the best, it is two and half.
Q. Well, I am not comparing it with the west.
A. Of the best, I say.
Q. I say, compare wells on the east side under the order of 1933 and under the present order.
A. Well, the 27 barrels that I gave you was what the well would have gotten on a potential basis. It actually would have been assigned forty barrels.
Q. What would be the comparison then?
A. That with what?
Q. What would be the comparison between a well on the east side under the order of 1933 and the present order?
A. Well, they would have gotten twice as much in total barrels per day allowable in 1933 as what they get now. In the total field allowable, it was twice as much.
Q. A little over three times as much, wasn't it?
A. It is a ratio of twenty to forty.
Q. That is right; pardon me. Now, isn't it a fact that comparatively, under that order the east side people got [fol. 536] materially less than they do under the present order?
A. Yes, they got some less.
Q. Now, isn't it true that under the order of 1933 the fairway people got comparatively materially more than they get under the present order?

A. Yes, sir, they did per well. Now, I haven't calculated it on a per lease basis.

Q. Isn't it true that the people on the west side under the 1933 order got comparatively more than they get under the existing order?

A. Yes, they got a little more. Of course, you are making all these calculations on a per well basis. If you put it on a per lease basis, you might get an entirely different comparison.

Q. Acreage didn't figure then, did it?

A. Not then, but now it does.

Q. We are taking representative wells. You are talking about an average well in the fairway and an average well on the east side and an average well on the west side?

A. Yes, that is true.

Q. Now, you talked about this map, that in this map here you had a green area. What exhibits are these two here?

A. Eleven and twelve.

Q. Defendant's Exhibit 11 and 12—that you had a green shaded area along the east side, and you said that that was the area in which pressures would go down and your wells would be abandoned, is that correct?

A. Yes, sir, generally speaking, that is true.

Q. That is your prophecy of what is going to happen?

A. Yes, sir, that is my prophecy.

[fol. 537] Q. Now, would that happen if the Railroad Commission were to maintain a top allowable that would permit of efficient operation?

A. I think it is going to happen under any way you produce the field.

Q. That is not an answer to my question.

A. I think that there is no way to produce the field as a practical way and prevent that thing from occurring.

Q. Will you answer my question, please? I think it is a fair question.

A. I think I have answered it. If you will state it again in any other way, I will do my best.

Q. An efficient operation, I take it, is one that will maintain the pressures in the East Texas field?

A. But if that cannot be done—I don't think it can be done.

Q. Why can't it be done if you let the water come in as fast as you take the oil out?

A. We have had nine years' history, and that never has occurred in that history.

Q. During that nine years, you have had several periods in which you have had excessively high top allowables, haven't you?

A. Yes, sir, and periods when it was shut in.

Q. If you get that pressure curve that they had here yesterday, that the Com....ssion introduced in evidence, you will see that invariably that when your allowables were high, your pressures went down rapidly, didn't they?

A. Yes.

Q. And when they would reduce their allowable, the pressure either stayed practically on an even keel, or close to that, isn't that correct?

A. No, the general trend in pressure, regardless of how [fol. 538] operated, has been down.

Q. I am not talking of the general trend; I am talking about what happened when the pressures were raised or lowered beyond the critical point.

A. Well, every time that the outlet of the field was increased materially, there was a temporary drop in the pressure, and when the field was lessened in daily production, there was a temporary lull of that; but if it was left at a constant rate of flow, the pressure continued to decline and has since it came in.

Q. I am not asking about a constant rate of flow; I am asking you if it is not possible to fix a top allowable that would constantly maintain those pressures?

A. I don't think it is possible, and make a practical order.

Q. Doesn't that pressure chart show that that can be done?

A. The pressure chart that I saw there shows that it has continued to drop.

Q. As a matter of history, it has continued to drop; but it dropped very slowly when they do not raise the allowable critically?

A. Yes, I think so; when the allowable was reduced, there was a temporary halt in the decline.

Q. Or even a raise?

A. Yes, at times there have been rises.

Q. What was the average pressure in the field in 1933?

A. What period?

Q. At the lowest point.

A. The lowest point at that high rate of production of a million barrels per day, why, it got down to about 1,210 pounds per square inch.

Q. That was the average?

[fol. 539] A. That was the average.

Q. What is it now?

A. 1,060 pounds, approximately.

Q. Then that showed what high top allowable would do and inefficient operation would do, didn't it?

A. No, I don't see any relation between those two at all.

Q. Well, the high allowable cut the pressure down, didn't it?

A. Yes, sir. Of course, you produced a lot more oil too.

Q. 150 pounds during the three years shows a very slow decline, does it not?

A. Yes, sir.

Q. In seven years, I mean.

A. I think that the field has been operated in a very efficient manner, and I think that the pressure has been maintained remarkably well.

Q. Now, if those pressures be maintained so that the gas will stay in solution, would this picture obtain?

A. No, if it had been possible to do that, that would not be obtained; but I don't think that it is possible to do it under a practical order.

Q. That is not what I asked you. That is for the Commission to say, isn't it?

A. Well, if that had been kept above the pressures that exist, those wells would not have been plugged and abandoned.

Q. You heard Mr. Patton's testimony in which he said that as long as those pressures were maintained high enough, that the gas wouldn't come out of solution, that it was all right?

A. Yes; I agree with that thoroughly.

Q. I beg your pardon?

A. I agree with that thoroughly.

[fol. 540] Q. Don't you think that efficient operation would require that the field be so operated as to seek to accomplish that end?

A. If such efficient operation is such that it is impractical to do it, I don't think it is efficient.

Q. That is not an answer to my question, Mr. Hudnall.

A. I will answer your question this way, that I think that if it were possible to do that and operate the field, that it ought to be done, but I don't think it is possible to be done.

Q. The Commission did that during the nine years of the field?

A. No, you have had wells plugged and abandoned.

Q. They are only on the extreme east edge of the field, aren't they?

A. Some of them are a mile inside.

Q. It is down here in this area where the gas has already come out of solution, isn't it?

A. Yes, sir, that is it primarily.

Q. Doesn't that prove the point, that in order to maintain efficient operation, you want to maintain your gas in solution by maintaining your pressure?

A. Undoubtedly, that is a desirable thing to do, but if it becomes impossible, you can't do it.

Q. I am not asking you if it becomes impossible. That is another question. Don't you think that ought to be an objective of the Commission?

A. Yes.

Q. So far as is possible, to maintain the pressure so the gas will not come out of solution?

A. That is correct, as long as they can do that and keep a practical order. I don't think the field should be shut in to get the pressure.

[fol. 541] Q. It won't be necessary to shut the field in to do that, will it?

A. You will have to shut these wells in to do it.

Q. During the last fifteen day shutdown period, how much pressure was built up?

A. I don't remember the exact figures.

Q. Can you guess at about what it was?

A. I think on a whole it built up some twenty pounds, but I would have to have the exact figure.

Q. Wasn't it more nearly thirty pounds?

A. It may have been. I don't remember the exact figures, but you can't produce a field when it is shut down.

Q. Now, Mr. Hudnall, you testified with reference to the ultimate recoveries of the Humble under what you said was the existing order?

A. Yes, sir.

Q. I want to know first what your assumptions were there, and I will ask you a few detailed questions on that point. What was your assumption as to what the field top allowable would be from time to time?

A. I assumed that it would remain about like it is as long as it would make it, and when it got to the point it wouldn't make it, it would be distributed in such a way as to give the properties that could make it that amount.

Q. Well, now, that is rather a little indefinite. Will you tell what you mean by as long as they can make it?

A. I say that the field as a whole wouldn't possibly make 690,000 barrels of oil a day throughout the life of that field.

Q. Very well, at what rate of flow did you stop—rate of flow for the individual well would you stop that top allow-

[fol. 542] able at, and then begin to cut it down?

A. Well, I assumed that the same conditions would prevail that prevail now as long as the field could make that, and when it couldn't, you would just have to reduce it from that top.

Q. If the field is gradually going to water, and as the water moves in from the west the field will get smaller and smaller?

A. That is true.

Q. In a few years it will be half as big as it is now, and in a few years more a quarter as big, and you don't expect the field allowable to continue at that high rate under those conditions, do you?

A. No, sir, I don't think at all that it could do that.

Q. Well, just how long did you figure that the top allowable would remain at 691,000 barrels per day?

A. I didn't give it any period of time. I assumed it would stay like it is now as long as it could make it.

Q. Unless you tell us how long you assumed it could make it, I don't know how in the world the Court is going believe that there is any value to your calculations.

A. Well, I think that I can explain it so that the effect of it will be understood.

Q. Well, I want you to answer my question.

Mr. Hart: We object to that. Let him make his explanation.

Mr. Baker: He hasn't answered my question yet.

Judge Sibley: The answer to the question comes first, and then the explanation, usually.

Mr. Hart: All right.

[fol. 543] A. Will you ask the question again? I didn't get it.

Q. Just how long should the field maintain this top allowable of 691,000 barrels?

Judge Sibley: In your opinion.

Q. In your opinion.

A. I don't know how long the field will make that. I believe that it would do it from ten to fifteen years. I don't know exactly. You just can't tell.

Q. What size would the field be?

A. What size would the field be?

Q. Yes.

A. I can't tell what size it would be.

Q. You don't know what the reserves would be then?

A. No, I don't know exactly what the reserves would be. I haven't calculated them.

Q. You don't know what the reserves would be in each of Humble's leases?

A. No, sir.

Q. And you don't know what comparative reserves the Humble has, in comparison with the field; you wouldn't know what that would be at that time, would you?

A. No, sir, but I think without any question that the Humble properties will produce longer than the average properties in the field, and if they do get currently some twenty per cent less or twenty-five per cent less and do produce for twenty-five per cent longer, they will produce as much oil as they have under them.

Q. Is that because of the fact that they have thick sands and more oil under them?

A. Certainly, and they are located well in the field. T just have a good structural position.

[fol. 544] Q. Ought not they to produce longer to produ e their oil?

A. They should and will.

Q. They will have to produce a good deal longer?

A. Yes, sir, about twenty-five per cent longer.

Q. You admit, then, if they maintained a top allowable of 691,000 barrels during the balance of the life of the field, Humble would have to wait four or five years after the field was exhausted to get its oil?

A. If you want to make that assumption. That is not a possible assumption to make.

Q. Now, then, what would the well allowables be? Would the well allowables be just the same as they are now, under your assumption?

A. No, sir, the per well allowable will, of course, go up as the wells are plugged and abandoned on the west edge of the field.

Q. That is not the way the Commission is operating the order at this time, is it?

A. I understand that when a well is plugged and abandoned, its allowable is taken off the schedule, yes, sir.

Q. In other words, the point I am making is this, that they are not maintaining a top 690,000 barrel allowable at this time, are they?

A. Well, no, not day by day.

Q. As new wells come in, they add to that 690,000 top allowable, don't they?

A. Yes, sir, I think that is true.

Q. That accounts for the fact that it is over 691,000 barrels now?

A. Yes. If the rate of drilling is greater than the rate of abandonments, that is what would occur.

[fol. 545] Q. Now, we will suppose, just suppose a situation in which 5,000 more wells were drilled and you add twenty barrels per day to each of those wells, would there be as much proratable oil as you now have?

A. No, not under that top.

Q. Then Humble would have to suffer more loss, share a part of that proratable oil with the new wells, wouldn't it?

A. I think the Humble ought to drill more wells and increase the recovery from their property and participate more from those.

Q. That is the remedy you suggest, to drill more wells?

A. If you are going to prevent waste, that is the remedy.

Q. If you are going to prevent waste?

A. Yes, sir.

Q. I would like for you to tell just exactly how many more barrels of oil on each of Humble's leases it could produce that it can't already produce by drilling more wells?

A. That would require detailed calculation on every lease.

Q. And I would like to know just exactly where you would locate each of those wells to get oil that wouldn't otherwise be produced if it were allowed to open its valves a little more and produce 14.3 per cent of the allowable under the present order?

A. I can tell you where I would locate them. I woul locate them out in the wide spaced areas between the well There is no question about that.

Q. That is because you just want to see more wells there I suppose?

A. No, sir, because the experience I have had from scien tific investigation and from observation on that field lead [fol. 546] me to the conclusion, without any question, tha the more wells you drill, the more oil you will get out.

Q. Now, just how much more?

A. Well——

Q. Just take any one of Humble's leases. Take thi section here, any one of Humble's leases, and we will dri one more well. I want you to tell the Court just how muc more oil the Humble would produce of its recoverable o than it could produce under the wells it now has, if its allow able were adjusted in such a manner as to enable it cu rently to get its fair share of the oil?

A. I can make such calculations. It will take some tim to do it.

Q. Do you know where there is any particular trap ther that could not be drained by the present wells?

A. No, but I know that there are individual traps all ove that end of the field.

Q. But you don't know where they are?

A. I think I can show you an illustration here that wi convince anybody they are there.

Q. I want to know what is under the Humble leases; tha is what I am talking about. I am not talking about any body else's lease. I want to get down to cases on this.

A. I haven't made a detailed study on the Humble lease

Q. You don't know how many wells ought to be drille or where they ought to be drilled on the Humble leases It is just a matter of conjecture, isn't it?

A. It is based on my knowledge of the field, and I kno those conditions exist.

Q. Somewhere?

A. That is right.

[fol. 547] Q. Now what kind of a rise of the water tabl have you assumed to back up your statement?

A. I haven't made any assumption on it.

Q. You haven't made any assumption on it?

A. No, sir.

Q. Now, would the answer be the same if the water table were rising on the level as if it were bulging up under the fairway where most of the Humble's properties are?

A. I think that that may affect it, but I think that without any question, that those leases are going to produce longer than the rest of the field any way you produce it.

Q. It won't do it if you hold the pressure down to the point where gas wouldn't come out of solution, would it?

A. Yes, sir, I think that those leases just by virtue of the fact that they have thicker sands and are located in the fairway, that they are going to produce longer than the rest of the field.

Q. Well, you take a lease here in the middle of the fairway at the point where the sands are thickest, and then take one on the east edge, say a thousand feet from the east edge, take the contours, and how much higher on the average would the wells on the east be on the structure than those in the middle of the fairway?

A. Generally speaking, they would be about forty feet.

Q. About forty feet?

A. Maybe eighty.

Q. Water presses oil uphill, doesn't it, because the oil is light?

A. That is correct.

Q. Now, won't you naturally expect water pressures under efficient operating conditions to keep on operating [fol. 548] here and keep on pressing oil uphill?

A. Mr. Baker, when you have a history of a field that shows you have over 160 wells plugged and abandoned over on the east side, to assume that you would have no more plugged and abandoned wells is ridiculous.

Q. I am not asking about that. Certainly, there will be, but those plugged and abandoned wells have been, so far, in there in the tight sand areas, haven't they?

A. Yes, but they extend all up and down that east side of the field.

Q. And your tight sand area extends all up and down that east end of the field?

A. That is correct.

Q. You have shale fingering in, and you have sands fingering east, and you have a very erratic condition over there on the east side, haven't you?

A. You have erratic conditions all over the field. They are a little more accentuated on the east side.

Q. You have places over there where there is very little oil sand?

A. Yes, sir.

Q. You would naturally expect them to play out pretty soon, because pressures can't be maintained?

A. That is the same reason lots will be plugged and abandoned before the water reaches them.

Q. Under efficient operation couldn't pressure be maintained to a point where gas would not go out of solution?

A. They have not been able to do that in the last nine years' history of the field, and I don't think they will in the future.

Q. Assuming efficient operation to a point where gas will [fol. 549] not come out of solution, they could, couldn't they?

A. If you could make that assumption, I think so; but I don't think you can make that assumption.

Q. Now, I want to know how much detailed calculations you have made as to the reserves under each of Humble's leases.

A. I took each lease individually and made a detailed calculation of the acre-feet of sand under every lease the Humble had.

Q. Well, you did that in making your isopach map?

A. No, sir, I did that before I made the isopach map.

Q. Now, then, have you calculated what each of Humble's leases will produce, assuming that the present order continues in effect?

A. No, sir, I have not made that calculation.

Q. All right. Now, have you figured just how long each of Humble's leases would produce if this order were to remain in effect?

A. No, sir, I have not made that calculation.

Q. It is possible to make such calculations, isn't it?

A. Yes, sir.

(The Court then, at 10:30 o'clock A. M. Friday, February 16, 1940, took a five-minute recess, at the conclusion of which the following proceedings were had:)

Mr. Moody: Shall we proceed, Your Honor?

Judge Sibley: Yes, sir.

Questions by Mr. Moody:

Q. Mr. Hudnall, this map over on the left, what exhibit is that, do you recall?

A. 14, I believe.

Q. 14.

[fol. 550] Mr. Hardwicke: 14; that is correct.

Q. And the red shows the area on the west that has been found to be productive of oil since 1934, is that the idea?

A. That is correct.

Q. And the area on the east colored in green shows the portion of the field that has been found to be productive of oil since 1934?

A. That is correct.

Q. Did I understand you to say that since 1934 the field has been expanded about 30 per cent?

A. Around 25 or 30 thousand acres.

Q. Around 25 or 30 thousand acres?

A. That is correct; around that.

Q. Well, let's take the minimum, 25,000 acres, that would be 20 per cent, wouldn't it, one-fourth——

A. That is correct.

Q. —of the field. Well, Mr. Hudnall, aren't you a little wrong in that? Doesn't your map—can't you look at your map and tell that there isn't 25 per cent or 30 per cent of the area of that field colored red and—on the west, and green on the east?

A. No, I think that is approximately right. Here is what it was based upon, an accurate count of the number of wells in that area, and the actual count of the number of wells was 3500 and 50 some wells.

Q. All right. Now, you are going by wells, and not by area?

A. Yes; and then I took the number of wells, and I know approximately what the density is—I don't know exactly, but it is about a well to 8 acres; that is the way it was arrived at. I will be glad to make the detailed calculation, if you want it.

[fol. 551] Q. Well, your map is accurate, is it, as to the area you have colored?

A. Yes, sir, it is.

Q. And you think—you testified that on that map, Defendants' Exhibit 14, about 20 per cent or 25 per cent to 30 per cent of the area is colored in red and green?

Judge Sibley: I think you all have figured wrong on that. Wasn't it 110,000 acres before this 25,000 was added?

Mr. Moody: Well, this is——

Judge Sibley: Percentage would not be quite what you say.

Mr. Moody: Yes, sir.

Q. How many acres did you say were added?

A. 25 to 30 acres, that is what I arrived at.

Q. Well, that would be about 100,000 acres, since there is now 131,000 acres in the field?

A. I think I can explain some of that discrepancy in there. The 131,000 acres is the present producing area; there has been about three to four thousand acres plugged and abandoned, and I estimated that at one time the field to have between 135 and 138,000 acres in it.

Q. All right. At any rate, you estimate the area colored there in green and red—that is, you have colored the right area in green and red?

A. That is correct. I will tell you exactly how that was done. I had the map made in January, 1934, and took that map and superimposed it on the present map, and that is what I got.

Q. Anyhow, you colored the right areas in green and red, and you say that is about 20 or 25 per cent of what was the field before?

[fol. 552] A. That is correct.

Q. Now, in the area where the field has been extended to the west, that area is all underlaid with water, isn't it?

A. Correct.

Q. And it is in that area that many of the abandonments that you speak of has taken place?

A. Yes, sir, there have been some 200 wells abandoned in this red and green area.

Q. All right. And the sands that the wells were drilled into in the area, so far as oil was concerned, or oil sand was concerned, it was a very thin sand, wasn't it?

A. Yes, sir, very thin.

Q. All right. Now, then, over on the east side where you have it colored in green, you don't come there to a straight line where this Woodbine sand plays out, and shale or some other formation starts in; it is an irregular line; isn't it?

A. Yes, sir, it is very irregular.

Q. In places the Woodbine sand fingers out into the non-oil bearing materials or formations, and in places the non-

bearing formations—oil bearing formations fingers out into the Woodbine sand, isn't that right?

A. Yes, sir, that is correct.

Q. So that like I put my fingers together here (illustrating) is that right?

A. Somewhat; not as the regular cogs of a wheel fit into another wheel, but somewhat that way.

Q. Yes, sir, somewhat that way. I think I could describe it a little more accurately this way, that after the Woodbine sand was deposed and prior to the time that the Austin chalk was laid down above it, which forms the cap of the pool now, [fol. 553] that there was a period of erosion in which the Woodbine sand was eroded away practically, and it was this irregular eroded surface that the Austin was laid down on, and that gives you those fingered conditions; in some places there are river channels extending out into it.

Q. All right. Those extensions on the east have been finding those fingerings where the Woodbine sand plays out to what is the really good oil bearing section of the Woodbine sand?

A. Yes, sir.

Q. Now, in those areas the quantities of sands found are relatively small, are they not?

A. Yes, sir.

Q. And the quantity of oil in place there is relatively small, as compared with the other parts of the field?

A. Yes, sir.

Q. And a good many of the abandonments that you speak of on the west side—the east side, rather, have taken place in that particular area we have just been talking about?

A. Yes, sir, a very large per cent of them.

Q. Now, do I understand from you that a gas cap has formed down at the south and on the east side?

A. There is a very small area that is affected by free gas.

Q. All right. That gas cap is gas that is out of the oil and up above the oil, isn't that right?

A. It is not exactly that way. The gas cap is—it is true that there is some free gas, but the oil is also there. The effect of it is that you get a high gas-oil ratio when you produce the wells that normally you get, say, 350 to 400 cubic feet of gas and over there, you get twice that much.

Q. Well, so that those of us who are not possessed with the same technical skill and knowledge that you are can under- [fol. 554] stand it, let me ask you if it is correct to say this,

that in that neighborhood of the field that you speak of out there where the wells have a high oil and gas ratio, whether the gas is in the sands up above the oil or in the sands down below the oil, the gas is out of the oil, isn't that right, not in solution in the oil any longer?

A. A part of it. Of course, there is some pressure there, and as long there is some pressure there, why, some of the gas stays in solution in the oil.

Q. Well, the gas is there out of solution, and also in solution?

A. That is correct.

Q. Originally that was not the case?

A. No, originally that was not the case.

Q. When that field was first brought in, why, there was no gas cap or free gas in that part of the field where the free gas or gas cap is now, was there?

A. That is true; there was no free gas there.

Q. That has been the result of production, hasn't it?

A. Yes, sir.

Q. And if the production on the east side had been less than it has been, the tendency would have been to hold up the bottom hole pressure and reduce the amount of free gas, isn't that right?

A. That is correct.

Q. Yes, sir. Now, Mr. Hudnall, really, this field gets its pressure from the water, does it not, underneath?

A. That is one of the chief sources; there are other sources, but undoubtedly the water is the chief source of energy—one of the chief sources.

Q. Well, the expansion of gas would be one source of energy, would it not?

[fol. 555] A. Yes, sir, that is a source of energy; I think that is an important source right at the time you are producing the well. It is not so important from the viewpoint of restoration of pressure.

Q. But the principal pressure in the field is the water pressure, is it not?

A. I think that is essentially correct. I do not follow the water drive to a 100 per cent, by any means.

Q. Well, there may be some other things in it, but that is the principal one, isn't it?

A. It is a very substantial source of renewed pressure, undoubtedly.

Q. All right. That water—there is a—the Woodbine sand over there at the East Texas oil field is at a depth of about 3600 feet below the surface of the earth, isn't it?

A. That is correct.

Q. And then it spreads out to the west and comes to the surface out there between Fort Worth and Dallas somewhere, a hundred and—how far, 175 miles to the west?

A. About 125 to 150 miles to the west.

Q. About 125 to 150 miles to the west, and it is somewhat in the shape of—the Woodbine sand is somewhat shaped like a "U", is it not, or, rather, we will say, a "J"?

A. More like the bottom of a canoe, with the East Texas field sitting up on one rim of it and the other rim of the canoe out from it.

Q. But the outcrop is higher than the place where you say the East Texas oil field is, is it not?

A. Oh, yes, the outcrop is approximately 36 feet higher than it is in the field.

[fol. 556] Q. All right. Now, it is rather—if I had a "U tube", that one side of it was six inches high, and the other side of it was two inches high, it would not be—the proportions would not be the same, but the principle would be there, would it not?

A. That is correct.

Q. And it is the water over here in the high column coming down against the oil over in the low side of the U tube that causes the pressure, is it not, or the principal part of the pressure?

A. That was the principal source of the pressure. It is generally conceded by everybody that has studied the problem now that the real cause of water infiltration into the field is due to the expansion of water, and not to the U tube effect. Now, that is very clearly demonstrated, in other words, from a calculation of the total volume of water that is in the Woodbine reservoir.

Q. All right. Then whether it is whether the water expands or because of the weight of the water being higher than the oil, anyhow, water furnishes the principal source of pressure?

A. Yes, sir; it is one of the principal sources of pressure.

Q. All right. Now, as long as you take oil out of that reservoir faster than the water can build the pressures back, you will have the pressures going down, won't you?

A. That is true; that is inevitable.

Q. Now, on the east side is where you have the low pressures, isn't it?

A. Yes, sir.

Q. And the fact that you have the pressures now so low that the gas is passing out of the oil on the east side demon-
[fol. 557] strates, does it not, that the oil has been taken out on the east side faster than the water and the other forces can contribute to the pressure there again and build the pressure up and keep it above that point at which the gas passes out of the oil?

A. That is very conclusive; that is correct.

Q. There is no question about that in your mind?

A. None whatever.

Q. All right. Now, then, the pressures on the east side are going down, are they not, at the present time?

A. Yes, sir, they are.

Q. From month to month as they have made their tests, the pressures have been going down?

A. Yes, sir, it is going down primarily with the rest of the field.

Q. All right. Now, then, if the 20 barrel minimum were eliminated from this present formula or proration, and the field were prorated on the fraction without the 20 barrel minimum, that would mean less oil to be taken out currently out of the east side, would it not?

A. Yes, I think it would.

Q. Well, you know it would, don't you?

A. Well, you don't know until you try it out.

Q. All right. You told the Court a while ago that the average well over on the east side produced about a little over 21 barrels per well, didn't you?

A. Here is what I mean to say, that there was about a thousand of those east side wells that just barely do make the 20, so if you gave them any more, you wouldn't affect their actual production.

Q. Well, if instead of letting them produce a flat 20 bar-
[fol. 558] rels, say you cut them down to five barrels, then there would be considerably less oil taken out of the east side, wouldn't there?

A. That is correct.

Q. And the pressures would stand up longer?

A. Yes, sir.

Q. And the more you take out of the east side, the more you contribute to the dissipation of the energies that make

possible the profitable production of oil in that field, isn't that true?

A. Yes, sir.

Q. All right. Now, Mr. Hudnall, what do you estimate to be the total amount of recoverable oil in the East Texas field at the present time?

A. I estimate it to be around four billion barrels.

Q. Four billion barrels?

A. That is correct.

Q. And you mean by that, that that is the amount of oil that they will get out of it?

A. Ultimately, yes; not future, but ultimately.

Q. That includes——

A. Past production.

Q. —past production of four million barrels?

A. Yes, sir.

Q. Well, what do you estimate to be the present amount of recoverable oil in the field?

A. It would be four billion barrels less about one million, three hundred fifty thousand.

Q. That would be 2,650,000,000 in round figures?

A. That is correct.

[fol. 559] Q. That is what you estimate is left over there now of recoverable oil?

A. That is correct.

Q. Now, Mr. Hudnall, with respect to the present order and its application to the East Texas field, you have got several figures on it, have you not, that undertake to allow properties to produce in relation—on the basis of their reserves and the capacity of the wells to produce?

A. Yes, sir.

Q. For that part of the formula that has the acreage times sand thickness times potential times bottom hole pressure is the numerator, and the sum of production of all of these for all wells in the field is the denominator, multiplied by the 176,000—that is the—that part of it you—is designed to give properties an opportunity to produce in relation to what they have and their capacity to produce oil.

A. That has relation to that, yes.

Q. Yes, and that is applied to about one forth of the daily allowable for the field?

A. Yes, sir.

Q. And the other part of it—the three fourths is distributed on the flat per well basis?

A. That is correct.

Q. And that three-fourths is distributed without any relation whatever to capacity of properties to produce or the reserves that they have under it; it is just a flat 20 barrels?

A. That is correct.

Q. All right. Now, Mr. Hudnall, I believe you said a while ago in answer to either Mr. Hart's questions or maybe Judge Sibley's—no, Mr. Hart's question, that you thought [fol. 560] that the field would produce at this 690 barrels, 690,000 barrels per day for fifteen years?

A. No, about ten—ten or twelve years.

Q. Ten or twelve years?

A. That is right.

Q. All right, sir.

A. And that is at the rate that it is being produced at, about 400,000 barrels per day. That doesn't mean it will produce 690,000 barrels per day.

Q. All right. Did you ever figure that out, 690 times two—you said five days a week?

A. Well, I figured it on 400,000 a day.

Q. All right. Did you ever figure that out, 400,000 times 365 times twelve years, and set that off against your two billion 650 million barrels of oil?

A. No, I didn't do it that way. I figured it this way, that at the rate, it would take about 17 years to produce all of the oil, and I knew it wouldn't do that for the full life of the field; so I just arrived at the ten to twelve years, and did on that basis.

Q. Well, if you would take 400,000 times 365 times twelve, you will get something above that 2,600,000,000 barrels of recoverable oil, wouldn't you?

A. No, I don't think it would do that.

Q. Have you got a slide rule there?

A. No, I have got a pencil to figure it out.

Q. Well, let's not take up time now to do that figuring.

A. I made a detailed calculation and figured it would take about seventeen years to do it.

Q. Well, I won't ask you to take time here to do that now. [fol. 561] Mr. Hudnall, do you say that you think it will be ten years before the oil gets to the Rowan & Nichols lease—the water, I mean, before the water gets to the Rowan & Nichols lease?

A. Yes, to get to it, even.

Q. All right. Now, you say you think it will take longer than that to drown it out?

A. Yes, I certainly do.

Q. Now, you said that was at the present rate of rise?

A. That is correct.

Q. That was your statement?

A. That is correct.

Q. All right. Now, then, Mr. Hudnall, it is a fact, is it not, that over on the east of that oil field where the sand is going up and on the rise, if you take a section of that field lengthwise—I mean a cross section of it lengthwise—perhaps I am not—I had better not—I was trying to talk in cubes and planes at the same time, but I had better not undertake to do that, since you are an engineer. But at any rate, the sands are thinner as you get farther to the east?

A. Yes, sir.

Q. They get thinner——

A. Yes, sir.

Q. —as you go up the structure after you leave the fairway?

A. Yes, sir.

Q. Now, then, when the water gets up in that section, it is apt to rise a good deal faster than it has been rising at the present rate of rise in that field, isn't that right?

A. Yes, sir, the rate of rise vertically will increase as the [fol. 562] cross section area through which the water moves decreases.

Q. All right. Then when you say that it will come to the Rowan & Nichols tract in some ten or twelve years——

A. Yes, sir.

Q. Well, there will be a great many years after that before the Rowan & Nichols tract will be drowned out——

A. Yes, sir, surely will.

Q. —at the present rate of rise?

A. Yes, sir.

Q. You are figuring the rate of rise in the field now where it is a tremendously wide area to rise over, and where it has not reached that part where it is going to be in that bottleneck where the rise will be more rapid?

A. That is correct.

Q. Now, you state that Rowan & Nichols tract was at minus 380?

A. No, 3180.

Q. 3180, I mean.

A. That is on top of sand, yes, sir.

Q. That is on top of the sand?

A. Yes, sir.

Q. Now, then, to the east of that 3180, the sand gets how high?

A. About 40 feet high; it gets to about 3140.

Q. About 40 feet higher?

A. That is correct.

Q. Now, then, the sand, it is about 90 feet thick under the Rowan & Nichols tract?

A. Yes, sir, that is the saturated sand. Of course, the interval from the top of the sand down to the water level is 140 feet; the water would have to rise 140 feet to flood the Rowan & Nichols lease.

[fol. 563] Q. And it has a 90 foot sand there anyhow, net oil sand, is that what you mean by that?

A. Yes.

Q. And it is minus?

A. 3180 to the top of the sand.

Q. To the top of the sand. Now, over to the east it is minus what?

A. 3140.

Q. All right. Now, is that the highest?

A. That is about the highest, yes, sir.

Q. How thick is that sand over there?

A. It pinches out completely.

Q. It gets down to ten feet, doesn't it?

A. Yes, sir.

Q. All right. But you have—in that 3140 contour, you have sands that are as thick as 30 feet, do you not?

A. Yes, you do, definitely.

Q. All right. There is sand to the east of this Rowan & Nichols tract, is there not, the bottom of which is higher than the top of the Rowan & Nichols sand, according to your own maps over there?

A. Yes, sir, undoubtedly.

Q. All right. So, now, then, if this oil moves up structure, it moves from the Rowan & Nichols tract up into the high sand at the east, the top of which is 40 feet high, and the bottom of which is some feet higher than the top of the sand on the Rowan & Nichols lease?

A. That is correct, if the water ever does flood that far east.

Q. All right. If it ever gets over there, why, that is what will happen.

[fol. 564] A. I think there is a possibility that it will get to the Rowan & Nichols lease; I don't think it will ever get to the east side at all.

Q. They won't get all that oil out, then?

A. No, I don't think they will get all that oil out on the east side, on that part of the field.

Q. You think it will get to the Rowan & Nichols lease?

A. I think the Rowan & Nichols lease is in that part of the field that is going to be approximately the place where the decline of pressure from the east causing abandonments is going to meet the area of plugging and abandonments from water coming from the west.

Q. Now, that decline in the east depends altogether on how much the Railroad Commission allows them to take out on the east, doesn't it?

A. I say that is a big factor.

Q. Now, you said, did you not, though, that it is your opinion that the Rowan & Nichols lease will some day be flooded out?

A. I think that that is possible under the rates at which the field has been produced in the past.

Q. All right. Now, then, you recognize, do you not, that the engineering profession generally takes the view that this water will rise over there and flood out, and finally get clear over to the east edge, as they take out all of the oil?

A. Well, quite a number of them do, and a number of them do not, Governor Moody. I believe I can express that better this way, that I have appraised over $100,000,000 of property in the East Texas field, estimating the reserves, placing values on them, and that I know that the public are [fol. 565] spending their money in the center of that field, and paying more for it there than on the east edge now; they are doing that.

Q. Now, since you mentioned that, Mr. Hudnall, your appraising property, when you appraise a property, do you take into account how thick the sand is?

A. Yes, sir, that is one feature of it.

Q. Yes, sir. You take into account the bottom hole pressure under that tract, do you not?

A. Yes, sir.

Q. Do you take into account what the potentials of the wells are on the tract?

A. Yes, sir.

Q. And from the combination of those figures and your deductions that you make for connate water, and various things, taking into account the porosity and permeability of the sand, and undertake to calculate for a man that you are valuing that property for, how much oil there is under the property, don't you?

A. Yes, sir, frequently do.

Q. And you can reach a value, can you not, on that sort of a calculation upon which people will buy and sell their oil properties?

A. Yes, sir.

Q. And upon which investment houses and banks and other investment houses will loan money on oil property?

A. Yes, sir, that is correct.

Q. And you also make those valuations for purposes of taxation and for use in lawsuits involving questions about how much the valuation or assessment ought to be for tax purposes?

A. Yes, sir, that is true.

[fol. 566] Q. And so those calculations about quantities of oil that a person has under his land can be made with sufficient accuracy to meet all the requirements of the business world in the matter of buying and selling leases, in the matter of lending money on leases, in the matter of taxation, and things of that kind, isn't that correct?

A. Yes, sir, that is true.

Q. Yes; in other words, it can be done for all business purposes, except the Railroad Commission somehow or other can't do it to give a man an opportunity to produce in proportion to what he has under his land.

A. I think the Railroad Commission made a pretty good effort when they put this formula into effect.

Q. Well, it happens to be your idea that you are here defending it, doesn't it?

A. Well, I recommended this formula, yes.

Q. Yes. You are the man that generated the formula, aren't you?

A. Well, I didn't generate it; I figured it out and recommended it.

Q. All right. You figured it out and recommended it. You have, through the life of this field, have you not been committed to the proposition that they ought to drill this field down to a density of about one well to two acres?

A. About two acres in the middle of the field, and about five on the edge.

Q. All right; and you have been committed to the proposition that the more wells you drill, the more oil you will get?

A. Yes, sir, very definitely.

Q. And in a multitude of cases where the contest was over permits to drill wells on tracts down to one-fourth of [fol. 567] an acre, you have testified, contending for the drilling of the well because it will lead to a recovery of more oil, haven't you?

A. I have testified in every case I have been in that the more wells you drill, the more oil you will get out.

Q. That is not my question. You have been in the court house testifying about the permits that ought to be granted on tracts of a fourth of an acre, haven't you?

A. I don't recall any tracts that small.

Q. Didn't you testify in the Greer case?

Judge Sibley: Well, I don't think that is a matter that is material here.

Mr. Moody: Well, I will pass that, Your Honor.

Q. You have also been one of those who has contended for a flat 20 barrels per well—for a flat 20 barrel per well allowable, have you not?

A. No, sir, I don't think I have ever contended that. I have recommended the order that the Railroad Commission put in in 1933.

Q. Now, then, you have also been one of those who has contended for the flat 20 barrel per—for a flat 20 barrel per well allowable, have you not?

A. No, sir, I don't think I have ever contended that at all. I recommended the order the Railroad Commission put in in May, 1933.

Q. Originally you undertook to defend, did you not, the order that allowed every well in the field a 20 barrel minimum, or the 2.32 per cent of the hourly potential, which allowed every well in the field a 20 barrel flat minimum?

A. No, sir, I made no attempt to defend the order. Judge McMillan can tell you what I testified in that case.

[fol. 568] Q. You testified in that case, didn't you?

A. Yes, sir.

Q. Did you express in that case the opinion that that would allow the properties in the field to recover reasonably in proportion to what they had?

A. No, I don't think you will ever find that I said that.

Q. You don't think you undertook to defend that order, then?

A. No, sir.

Q. You recognize, do you not, Mr. Hudnall, that with that formula and a 20 barrel minimum per well, that the wells over on the west side and the wells over on the east side are allowed to produce more in proportion to the oil in place under the tracts than wells in the center of the field where they have the thick sand?

A. Yes, sir, that is true.

Q. And now, Mr. Hudnall, as long as you undertake to prorate that field, or by "prorate" I mean allocate your field allowable among wells in the field on the basis of three-fourths of the allowable being distributed on a well basis, and one-fourth being distributed on the factors that undertook to take into account the reserves of the properties and the productivity of wells on the properties, the result will be that the poorer properties will get more than the properties that have the deeper sand, drilling density being the same?

A. That is true as to the east side of the field. It is not necessarily true as to the west.

Q. Well, now, on the three-fourths—one-fourth basis, won't—assuming a tract of five acres, with one well to five acres on the west, and one well to five acres in the center, and one well to five acres on the east, you fix your field allow-
[fol. 569] able and distribute that field allowable among wells on the basis of one-fourth—on the factors we have been over here, and 20 barrels on three-fourths of the daily allowable on the flat per well basis, which tracts—the tract with less reserves and less recoverable oil under it will inevitably get more in proportion than the five acres that has the thicker sand and the greater amount of recoverable oil, as long as the factors are applied?

A. That is true on the east side, but not on the west side.

Q. It is true on the east side, if a man has got a five-acre tract with 10 feet of sand under it, and he has got a bottom hole pressure, let's say, of 800, and over on the west side a man has got a five-acre tract with 10 feet of sand under it, and has got a bottom hole pressure of a thousand or

1100, and in the middle there is a man that has got a sand thickness—five acres, a sand thickness of 90 feet, and has got a bottom hole pressure of about 1100, and the potential on the west is down lower than the potential on the center tract, and the potential on the east is lower than the potential on the center tract, and you are going to prorate it one-fourth on the factors and three-fourths on the flat per well allowable; and you say the man on the west won't get more in proportion to what he has than the man in the center?

A. He will, of course, get currently more, but not ultimately.

Q. You say ultimately you don't think he will?

A. No, sir, I don't think he will.

Q. Can you tell me when the man in the center will begin to produce ratably along with the fellow over on the east?

A. When the fellow over on the east is plugged and abandoned, and the fellow on the west is plugged and abandoned.

[fol. 570] Q. If the center lease lasts longer than the fellow's lease does on the east, and the fellow on the west, he will catch up?

A. Yes, sir.

Q. Do you know—can you tell me whether that is going to inure to his benefit or the benefit of his grandchildren?

A. That will all depend upon the circumstances.

Q. You don't know how many years it will be, do you?

A. No, sir.

Q. Let's take this map here. Here is the center of the field, is it not?

A. Yes, sir.

Q. That is where the thick sand is right through there?

A. Yes, sir, that is true.

Q. Over on this side is where you have got this higher area, higher structure over here?

A. Yes, sir.

Q. You say you don't think the water will ever get over into that red over here?

A. No, sir, it won't throughout the entire field. There will be places where it will.

Q. It is going to get into this part here?

A. Yes, sir.

Q. And that is the fairway?

A. That is correct.

Q. After this man is in the water, and this man on the east is still producing on that one-fourth—three-fourths method of prorating, the situation you just spoke about won't come about, because he will be drowned out, and he will be producing oil, and water won't get over there?

[fol. 571] A. No, the pressure may have declined to where the fellow on the east is gone long before water gets there.

Q. They won't be producing in that higher section in there?

A. That is correct.

Q. Mr. Hudnall, is it not true that any method—rather, this question. Isn't it a fact that in the present application of this formula in the field, that the Railroad Commission is calculating sand thickness on the west side, that the original sand thickness, notwithstanding the fact in places the water has risen as high as 25 or 30 feet, and there has been an average rise under the west part of the field of about 8 or 10 or 15 feet, somewhere along there?

A. That is correct.

Q. What is the average rise? Do you know?

A. I don't know exactly. I have made some calculations on it. My calculations indicate about 8 to 10 feet.

Q. That is the average?

A. Yes, sir.

Q. There are places where it has risen as high as 30 feet?

A. Yes, sir, definitely.

Q. If you apply that formula, the man who got—where the water has risen 30 feet, his allowable is calculated as though the 30 feet where the oil has been taken out and replaced with water, as though that were still all oil; isn't that right?

A. That is correct.

Q. And the order is being so applied over all of that part of the field where it is under water, as shown by one of these maps we had here colored in red?

A. Yes, sir, that is true.

[fol. 572] Judge Sibley: What about potentials? Do they use old potentials, or the present?

A. They use the old potentials.

Judge Sibley: Do you attempt to justify that?

A. Yes, I think there is some justification of using higher potentials on the west there.

Judge McMillan: If you are going to use the sand thickness as one of the parts of your formula, why do you use the old sand thickness?

A. That is the present purpose of giving the wells that have 10 feet of sand the benefit——

Judge McMillan: That is sort of a handicap?

A. No, sir, that is for their benefit.

Judge McMillan: You are handicapping the other fellow?

A. Yes, sir.

Judge McMillan: Trying to do something God Almighty didn't do to put them on better structure?

A. The real purpose of allowing them ten feet was to allow them all something. If you just took that formula and applied it straight without any minimum allowable, some wells would get less than two barrels and couldn't be operated, and the purpose for interpreting the sand as 10 feet clear to the edge was to in some way give them something to operate on.

Judge Sibley: Do you know what the 20 barrel minimum or 11.7 barrels, whichever way you look at it, what that is for, aside from the legislative marginal wells, what that is for?

A. My judgment is it is for this purpose, that if those wells on the west side begin to make a lot of water, they cannot be profitably operated below 10 barrels. They could go down to 10, but under the way it is being allowed, they [fol. 573] are getting 11.7, and could go below that, but as a whole, that is about where you reach the point of economical operation on the wells that are making a high per cent of water.

Judge Sibley: Mr. Fischer suggested that an effort to return their investment on the well, along with the well operation, that is to be considered. Do you know whether that is ever figured on?

A. I will say that every well has some characteristic that is characteristic of an oil well and that is common to all oil wells, and one of those being in the East Texas field, it costs about $10,000 to drill one. Every well costs that everywhere in the field. That is a common element, and it represents from one-third to one-fourth of the value of the wells. In the middle, they are worth something more than that, but in general, that is about the way it runs.

Mr. Moody: Are you through, Your Honor?

Judge Sibley: Yes, sir.

By Mr. Moody:

Q. Mr. Hudnall, didn't you testify in the prior Rowan & Nichols case that it was necessary to give these wells a flat 20 barrel per well allowable in order to encourage drilling, that if you didn't give them that much allowable, a fellow wouldn't drill his well, and it was necessary to keep drilling wells?

A. Yes, sir; you can't drill wells and operate them—you can operate them down to 10, but you can't drill and produce on 10 barrels on the edge of the field. You just can't do it.

Q. Let me ask you this. Didn't you testify in that trial that disregarding that cost of drilling, just operating cost, you could produce those wells at 5 to 10 barrels and make [fol. 574] a profit on them?

A. That is in the middle of the field, but you can't, and I didn't so testify on the edge of the field.

Q. What did you say about parts of the field?

A. I don't know.

Q. You illustrated that you had a well with about 5 barrels——

A. No, I said my well was plugged at 10 barrels.

Q. You further testified there was a lot of water, and you were having to dispose of many, many times as much water as you were getting oil, and you really had a salt water well and not an oil well?

A. I said the well was making over 90 per cent water. I don't mean to lead this Court to believe you can operate a well in the center on less than 10 barrels, and you can't.

Q. About these potentials, that is one of the factors you multiply by in your formula?

A. Yes, sir.

Q. Now, then, so far as your potentials are concerned, they are not actually taken, but are calculated; isn't that right?

A. On each well they are not taken. On the key wells they are taken and are computed.

Q. You have got how many key wells?

A. About 270.

Q. 270 key wells out of 27,000. Take—26,000. You take the potential of about one in a hundred?

A. That is right.

Q. And from those wells you draw contour lines; isn't that right?

A. Yes, sir.

Q. And you divide out the distance between contour lines down into what number of feet?

[fol. 575] A. Well, you divide them out, depends upon the relative capacities of the two wells you are contouring between.

Q. Have we got a potential map over here?

A. I haven't seen it, if it is there; but generally speaking, it is contoured on 10 barrels per hour contour.

Q. It is contoured on 10 barrels per hour, and if you have got an 800 barrel potential line and a 700 barrel potential line, you just divide that distance actually, don't you, by 10?

A. Yes, sir.

Q. Between the controlled wells, and over to the edge of the field, 300 barrels is as far down as you take potentials, isn't it?

A. Yes, that is as far down as they take the potentials. The other contours from there to the edge of the field——

Q. Are largely a matter of projecting?

A. No, they are controlled by dry holes.

Q. And you know, do you not, in the East Texas field, wells whose potentials are calculated on that formula up as high as 200 barrels, they won't make 10 barrels to the well per day?

A. That is true.

Q. They are wells whose potentials, when you apply this formula to them, they are calculated as wells having 200 barrels per hour, and they won't make 10 barrels a day?

A. There are wells in the middle of the field that are contoured as having an allowable, and are dry holes.

Q. You are talking about wells that are producing under your formula?

A. Yes, but they get a very small fraction of a barrel by that potential.

[fol. 576] Q. Here is the question I have had in mind with respect to the former trial, page 552.

"Q. Now, from the standpoint you were talking about, profitable operation of a well, after a well is played out, why, it can be operated at a profit on an allowable from 5 to 10 barrels a day, can't it?

A. You are cutting hairs pretty fine when you pinch wells down to 5 to 10 barrels a day. They can be operated,

but not with much profit. I had one well on the west side of the field I had to abandon when it got down to 10 barrels a day, and that was when we had a little better price than we have now.

Q. That was over in the water zone, wasn't it?

A. Yes, sir.

Q. You were having to take a good deal of water with your 5 barrels?

A. Yes, sir.

Q. All right. That complicated it considerably when it came to operating costs?

A. Yes, but there are some 3,000 or 4,000 wells making water that would have to be considered if you attempted to pinch those below 10 barrels."

That was your testimony, wasn't it?

A. That is my testimony then, and that is it now.

Q. Now, then Mr. Hudnall, the—in the application of that formula, then, to the west side, is it not true that wells are given the advantage of having a sand thickness which, in reality, they do not have because of the encroachment of water, and those wells are given the credit for having a potential which, in fact, they do not have?

[fol. 577] A. Yes, sir.

Q. Because of the loss of the productivity of the well, and isn't it further true that on the east side, in the application of that formula, wells are given a potential—I mean an allowable, based on a potential very much higher than the potential that they have, and based upon also a sand thickness that doesn't take into account the net sand thickness but taking out of it this hard stuff and shale, and one thing and another that you have been talking about as being over there on the east side?

A. That is true.

Q. And it is a further fact, is it not, that even after you give those wells on the west and the east that handicap, you are also—you are allowing them to produce very much—if you treated it all as saturated sand, and you treated it all as having the potential that they don't have, nevertheless, those wells would all produce more currently, according to what they have in their capacity to produce, than the wells in the fairway in the very best part of the field?

A. Correct.

Q. All right? Now, Mr. Hudnall—Mr. Tilley calls my attention to another question.

"Q. Where you have water to deal with, that complicates the thing, but wells in that field, if they are paid out, they can be operated at a profit on some production of somewhere between 5 or 10 or 12 barrels a day?

A. That is correct."

A. That is still correct.

Q. Mr. Hudnall, a while ago, you said the wells over on [fol. 578] the east, some of them, would quit producing before the water got over there. Assuming a tract on the east has 5 acres and 10 feet of sand, under this formula how much oil will that man have taken out, in proportion to his reserve, before his well quit producing?

A. I can't answer that question.

Q. Well, he would—he will have taken more than there was oil originally in place under his tract, won't he?

A. Generally speaking, that is true. I wasn't trying to evade the question. The whole thing would depend upon permeability. He might have one of those wells making 6 barrels a day.

Q. We will take most any tract on the east edge where a man has 10 feet of sand and a 5 acre tract, and a well on it, let him have about what is the ordinary normal potential they give them over there, and apply that formula; give him his 20 barrel minimum, and apply the formula to him, and he will take out more oil than he had originally under his land before ever the water gets to him, or before ever the well ceases to flow?

A. If he is in a good sand, he will do that.

Q. When you take some of these fellows on the east side in this area, what do you call this part? This is Kilgore right here, is it not?

A. Yes, sir, that is the Kilgore townsite.

Q. Right out all around in there it is just as densely drilled, almost, as it can be, isn't it?

A. Yes, sir, it is drilled up to about a well to an acre over a large part of the townsite.

Q. I am not talking about any special tract, but taking something like where there is a section of land, I believe [fol. 579] that is the Alexander Survey. I am talking about taking in this area here where the dense drilling is, and you apply your—give those wells 20 barrel minimum, and apply

the formula to them, and those wells will produce from beneath those tracts more oil than there ever was under them before ever they are drowned out, or before they go off of production; isn't that true?

A. Generally speaking, that is certainly true.

Q. And you could make that true on an area of a section of land, 640 acres, couldn't you?

A. You probably could there to the west. To the east, of course, there are already 15 or 20 wells plugged and abandoned.

Q. There are wells around the outskirts of Kilgore that are as good as any in the field?

A. Yes, sir, there are good wells.

Q. For instance, you take up here in the J. Moseley and D. Moore and C. H. Alexander Survey, where it is densely drilled, right south of Rowan & Nichols tract, and adjoining the Castleberry Survey, in the application of this formula, those surveys will get much better benefit out of that order than the area around the Rowan & Nichols tract where it isn't so densely drilled?

A. Yes, sir, they will get some benefit out of it.

Q. That all comes about, doesn't it, by reason of the flat 20 barrel per well minimum?

A. Yes, sir, that is right.

Q. On that 20 barrel per well minimum, have you ever known of the Railroad Commission putting an order in force in East Texas that allowed the wells to produce less than 20 barrels a day on the days they were allowed to produce, since the marginal well law went into effect, if they could make it?

[fol. 580] A. No, they have never had that.

Q. Every proration order they have had since that time allowed every well in the field that could make 20 barrels, to to make 20 barrels, didn't it, in its practical application?

A. Yes, sir, that has been true since June, 1933, when they dropped it from 40 down to 20.

Q. That was about the time the first marginal well law went into effect, the 20 barrels?

A. At 20 barrels, yes, sir.

Q. And ever since then, they have been giving them 20 barrels if they would make it?

A. Yes, sir.

Q. And now, when they get to where they have got so many wells they can't produce the field on seven days a

week and allow the 20 barrels and stay within the marginal well law, they just cut down the number of days they allow them to produce in a week, and allow them 20 barrels?

Mr. Hart: If the Court please, that includes a question of law.

Mr. Moody: —and let them get 20 barrels——

Judge Sibley: Yes, you are putting motives in with the facts.

Mr. Moody: I beg your pardon.

Q. The facts are these, that when the number of wells drilled in the field got so great and the market demand got down so low, that they couldn't produce all of the wells in the field capable of making 20 barrels a day with a minimum of at least 20 barrels a day and keep the field producing seven days a week within the market demand, then the number of days that the wells were allowed to produce [fol. 581] during the week was cut down, and the wells were allowed to produce certain days, if they would produce the 20 barrel minimum; isn't that right?

A. I can tell you when they did it.

Q. I am not asking you when. I am asking if that isn't true about the orders in the field.

Judge Sibley: The orders say that.

Mr. Moody: I don't think we have all of them here. I am talking about over a period of years.

Judge Sibley: We had the stipulations since August.

Mr. Moody: I am undertaking to show back of August.

Judge Sibley: Why should we worry about those back ones, anyhow?

Mr. Moody: Very well, sir.

Q. Now, Mr. Hudnall, with respect to these so-called marginal wells, these wells that cannot be made to produce in excess of 20 barrels a day, prior to June 24, 1940, is it not a fact that what the Railroad Commission did was to allow those wells to produce over seven days what was their maximum capacity or would have been their maximum capacity for four days, if the shutdown period was three days a week, and five days, if the shutdown period was two days a week?

A. That is correct.

Q. And so, up to January 4, 1940, the Railroad Commission undertook to curtail the production even of the so-called marginal wells; isn't that right?

A. Yes, sir.

Q. That is all, Your Honor.

Mr. Saye: I would like to ask one or two questions, if Your Honor please.

[fol. 582] Cross-examination.

Questions by Mr. Saye:

Q. Mr. Hudnall, the effect of the modifications of the order permitting the marginal well to produce seven days out of the week, now, the effect of that is that if the marginal well produces, say, 19 barrels per day daily, and then immediately offsetting that you have a well that is better than a marginal well, that will produce above the 20 barrels within a week's time, then the so-called marginal well will be permitted to produce 192 barrels more per week than the well that is permitted to produce the 21 barrels, won't it?

A. I don't get quite that much oil, in my head calculation, I will be glad to make a more detailed calculation.

Q. I should have said in a month. It is 48 barrels per week. See if that isn't right.

A. I get 53 barrels, total.

Q. You take a little more than four days on one, 53 barrels, which one——

A. The well that produces 19 barrels a day for seven days a week produces 133 barrels. The well that produces 20 four days a week would produce 80; so, the 19 barrel well will produce 53 barrels total more during the week.

Q. Well, I put it, I think my figure was on 21 barrels. That would give the illustration I wanted to know. If you made a correction so as to permit the offset well to produce as much as the marginal well, that would also create a condition where you would have to make the same correction to the offset well to that well, and carry that plan on progressively, so that you would reach the practically flat allowable—I mean minimum allowable of 20 barrels?

[fol. 583] A. Yes, sir, that is true, a minimum of that. It wouldn't necessarily mean that each well would have to have exactly that.

Q. Well, it would be approximately the result, wouldn't it?

A. Yes, sir.

Q. Now, Mr. Hudnall, at the time this suit that Mr. Baker was talking about was brought back in 1933 and tried before Hutcheson, Judge Wilson, and Judge Bryant in Fort Worth, that is the suit you referred to attacking the potential order, wasn't it?

A. Yes, sir, it was.

Q. Had the limits of the field been defined at that time?

A. The limits were indicated. The field wasn't developed.

Q. What was the total allowable, the top allowable, at that time?

A. It reached a little over 800,000 barrels a day, around 815,000 as I recall it, about the time of the trial.

Q. The top allowable at the time, with the field developed to that extent, was in excess of 800,000 barrels?

A. Yes, sir, it was.

Q. And that suit was brought by the Humble and a number of other companies together, wasn't it?

A. Yes, sir, the Hunt Production Company filed the suit, and the Humble and a great many others were intervenors.

Q. And they were denied the interlocutory injunction on that?

A. Yes, sir, that is correct.

Q. That is all.

Questions by Mr. Baker:

Q. I wanted to ask you a question or two, please. Mr. Hudnall, isn't it true that comparatively speaking, prac- [fol. 584] tically all of the wells in the East Texas field have been completed about as much as two years?

A. There were about 400 wells drilled last year and about 1700 the year before, as I recall the figures, and all other than those were completed more than two years ago.

Q. I see. Now, isn't it a fact that those wells which have been completed more than two years should have paid out under the allowables permitted?

A. Most of them would be, only in those where they were drilled in the margin of the field, and had unusual problems such as water production, or high pumping cost due to paraffin that would be the case.

Q. Then, from an economical standpoint, the problem for most of the wells is merely operating cost; isn't that true?

A. Yes, if they just want to break even.

Q. Isn't it a fact, Mr. Hudnall, that there are many wells in the East Texas field that have been producing 5 barrels or less over a long period of time?

A. Yes; there are not a great many, but I believe there are some fifty or one hundred of these sub-marginal wells on the east side. They don't have any of those on the west side that I know of, but there are a number of them on the east side that have produced down to that.

Q. Up until the February order, they stood their part of the cut incident to the shutdown days, didn't they?

A. Yes, sir; that is true, but in most of the cases, those wells were cases where they had one marginal well and from one to five other good wells on the lease, so the whole lease was operated, and the marginal well was operated just as a part of the lease.

Q. But they continued to operate the small wells?

[fol. 585] That is correct.

Q. I would like to get something clear in my mind that you were testifying about a while ago. I want to ask you about the well, say up here in any part of the field, a well on the east side in any part of the field where you have a good sand, it is ten feet thick, and you have average potentials and average pressure, how, assuming an efficient operation for this field maintenance of a top allowable at such figure as for a reasonable length of time would maintain gas in solution, how long would you expect a well with ten feet of good sand along the east side to produce, how many years?

A. If it is real good sand, I think it will produce for fifteen to twenty years.

Q. Fifteen to twenty years?

A. That is right.

Q. How many acre-feet of sand would a five-acre—well, on a five-acre tract, or, rather, a five-acre tract have?

A. A five-acre tract with how many feet of sand?

Q. Ten feet.

A. Fifty acre-feet.

Q. Fifty acre-feet of sand. Assuming that a 900 barrel per acre-foot recovery, how many barrels of oil in place would that five acres have?

A. 45,000.

Q. 45,000 barrels. Under this existing formula, proration order, what would be the production per day of one well on such a five-acre tract?

A. It would average about 11.7 or possibly 12 barrels a day throughout a thirty-day period, about 12 barrels, say.

Q. Would you compute, figure how much oil that five acres would be permitted to produce under this order dur-
[fol. 586] ing the period of the producing life of that property?

A. About 65,000 barrels, on a fifteen year life.

Q. Haven't you made a mistake there?

A. I don't see it.

Q. All right. 65,000 barrels. Now, suppose that instead of having one well on that five acres, you have five wells on that five acres, what would be the average allowable per well?

A. That would still be approximately the same as the other.

Q. How many barrels a day would that tract be permitted to produce?

A. About 60 barrels.

Q. About 60 barrels a day. Would you please figure how much that tract would be permitted to produce during fifteen years remaining life?

A. About 325,000 barrels.

Q. Against 45,000 barrels in place?

A. Yes, sir.

Q. There are many areas in the—along the east side of the East Texas field, say in the eastern one-third of the East Texas field where you have densely drilled areas in there, are there not?

A. Yes, sir.

Q. And you may not get as much, then, proportionately, because those wells would be permitted to produce much more than the reserve?

A. That is correct.

Q. Many times more in many cases, would they not?

A. Yes, sir.

Q. Where would that oil come from?

A. It would come from the thicker sand area from the
[fol. 587] west and from the west side of the field. It would be replaced continuously to some extent.

Q. Wouldn't most of it come from the fairway?

A. That is true. It would come from the fairway, but the fairway, in turn, would get it from the west, but actually, there wouldn't be any of it that would move more than a thousand or 1500 feet.

Q. Any possible drainage from the west to the fairway isn't at all in proportion to the drainage from the fairway east, is it?

A. No, sir; it isn't exactly, no, sir.

Q. That is because there is so much more oil, the sand is so much thicker in the fairway?

A. Yes, sir; that is true.

Q. I believe that is all.

Redirect examination.

Questions by Mr. Hart:

Q. Mr. Hudnall, you were asked certain questions about the practice of the Commission on this isopach map which was introduced here, of showing the original sand thickness. In the producing life of leases on the west side of the field, I believe you have already testified they would have a relatively short producing life; is that correct?

A. That is correct.

Q. Unless they get their oil now, they will not get it?

A. That is correct, and they will not drain very much oil from anybody else.

Q. If,—I am not speaking of the densely drilled tracts, but the average tracts on the west side.

[fol. 588] A. Yes, when you take the area as a whole and compare it to the rest of that field.

Q. If they are to be allowed to get their oil. There has been some reference of some compensating factor to allow them to get a relatively higher percentage at this time. Is the pressure factor one of those factors?

A. Yes, sir.

Q. And is the fact that the Commission gives to them the original thickness one of the factors that lets them get their oil while they can still produce?

A. Yes, sir.

Mr. Moody: By their oil, do you mean the oil under their leases?

Mr. Hart: I mean the oil underneath their leases.

Q. There were some questions asked you by Governor Moody with reference to the rise in the water table, and I believe you testified that, of course, as the field was depleted to the east, the rise would become greater when you got over toward the east side of the field?

A. Yes, sir.

Q. What would be the relative rate of rise in the water between the rise, as comparing the rate of rise from the opening of the field up to date, and the rate of rise that would be expected from now until the water got to the Rowan & Nichols lease? Would there be very much difference in the rate of rise?

A. Very little difference, probably less than 10 per cent, but in terms of feet, it would be less than a foot a year.

Q. I believe there were some questions about the Defendants' Exhibit 14. By 1934 there had been estimates made as to the extent of the limits of the field, was there not?

[fol. 589] A. Yes.

Q. Those estimates went beyond the actual drilled areas, didn't they?

A. Yes, I made estimates even in 1931 and estimated at that time there was 121,000 acres in the field between the limit lines, but it wasn't all developed.

Q. These additions that you have spoken of are additions to actually developed portions of the field, not necessarily additions to estimates that had been made of the field's extent?

A. Yes, sir; that is correct. It is the actual areas on which they have drilled wells, on which there were no wells before.

Q. There was a question asked you whether if parts of the field were abandoned in the future, the allowable to the wells would go up, and I think the phrase "allowable per well" was used at one time. Did you or not mean by that the base or minimum allowable would increase, or did you mean the production of the well would increase?

Mr. Moody: We object to that because he couldn't possibly know whether the Railroad Commission is going to distribute the excess on the formula basis, or per well basis.

Mr. Hart: That was asked him.

A. The total production from the well would increase.

Q. That is what you meant in reply to the question?

A. That is correct.
Q. I think that is all.

Recross examination.

Questions by Mr. Moody:

Q. I would like to ask one question. Mr. Hudnall, with respect to that rise of the water under the Rowan & Nichols lease, you claimed wouldn't be more than 10 per cent, that [fol. 590] depends, does it not, upon the rate of withdrawal from the field remaining, in that ratio that 699,000 bears to the 3 billion—2,600,000 you say there is oil remaining in that field?

A. It would be in the ratio of the volume withdrawn, yes, sir.

Q. And as the per cent of—as the ratio of that withdrawn to that remaining in the field increases, that rate of rise of water will increase, and also as it gets into that narrow part of the field it will increase, the rate of rise?

A. That is correct.

Mr. Moody: That is all.

Judge Sibley: We will adjourn until 2:00 o'clock.

Thereupon, Court was recessed at 12:00 o'clock M. until 2:00 o'clock P. M.

[fol. 591] Friday, February 16, 1940

Afternoon Session, 2:00 o'clock

Ionel I. Gardescu, a witness for the defendants, was sworn, and testified as follows:

Direct examination.

Questions by Mr. Hart:

Q. State your name, please.
A. Ionel I. Gardescu.
Q. Where do you live, Dr. Gardescu?
A. In Houston.
Q. What is your business or occupation?
A. I am a consulting petroleum engineer and geologist.
Q. Would you state briefly your academic training or education for your profession?

A. My college training was begun in Rumania before the war. I took three years at the Polytechnic University. Then I went into the Army and fought in the war as a commissioned officer. And after that I took one year of university work at the Royal Technical College at Glasgow. I majored there in chemistry and physics. In 1920 I came to the States, and I took my specialized work in geology and petroleum engineering and received my professional degree of petroleum engineering in 1922 from the University of Pittsburgh. Then I followed that with the academic training. In 1926 I started on my post-graduate work at Stanford University and at the University of California, also pursuing my graduate work in geology and petroleum engineering. I received my Doctor's degree in petroleum engineering from the University of California.

[fol. 592] Q. When did you receive your Doctor's degree at the University of California?

A. 1931.

Q. Now, have you had practical experience in the practice of your profession, and particularly in the work of evaluation of oil and gas properties?

A. Yes, sir.

Q. Would you state just briefly what experience you have had along that line, what practical experience?

A. In 1920 I was engaged by the firm of Johnson, Hunting and Summers as a valuation man. That same year one of my early papers on valuation had been published in the Bulletin of the American Association of Petroleum Geologists. I pursued my valuation of geological properties. In 1923 I was invited by the Rumanian Government to come to Rumania and organize and be head of their department of oil and gas valuation, which I did. After I finished that job, I was with the Standard of New Jersey in Rumania as their sub-surface geologist and petroleum engineer, and I resumed my activities in valuation. And since 1936, when I established my headquarters in Houston, I have been continually engaged in valuation work, and my firm now, that is Gardescu and Speed, we are engaged actively in valuation work. I also taught valuation for five years, four years at the University of Pittsburgh and one year at Texas A. & M. College, 1933 to 1934.

Q. What experience have you had in connection with the East Texas oil field?

A. East Texas oil field. I kept in close touch with it. I wasn't in charge of any active project, but I kept in close touch beginning in 1931, I believe, when the Gulf Research Laboratories, I was research engineer for them, and they were following that very closely, and since that time the [fol. 593] Bureau of Mines has sent me on several occasions reports; some are confidential reports, and I collaborated with them. I visited the field several times. I made studies. In 1934 I was accompanied on my trip there by the sub-surface geologist of the Texas Company who is in charge of their sub-surface work, and on and off I studied some Rule 37 cases, and then I studied a great deal, everything that was said and done by the East Texas field.

Q. Are you a member of the Houston Geological Society?

A. Yes, sir.

Q. Have you worked with other geologists and petroleum engineers in Houston in the formation of a reference library in Houston which is used by them?

A. That is not connected with the Houston Geological. The Houston Geological have what they call study groups, in which they study various problems, and one of their major problems is the question of valuation of oil and gas reserves as it occurs in different fields, and during the last three terms I was the group leader in this study group. Now, that other question, the expert witness reference library, it was a study I made for some companies.

Q. Which companies do you refer to, please?

A. I beg your pardon?

Q. Which companies do you refer to?

A. The companies that supported that were the Humble and the Texas Company.

Q. Dr. Gardescu, have you studied and are you familiar with the leases of the Humble Oil & Refining Company in the East Texas oil field?

A. Yes, sir.

[fol. 594] Q. Have you made detailed studies of their leases in order to make an estimate of the ultimate production from their leases, based upon the depletion of their leases which had occurred up to about August 15, 1939, at the time a questionnaire was sent to them by the Commission—or at the time they answered the questionnaire of the Commission?

A. Yes, I have. I have studied the depletion of all of the leases of the Humble Company that were classified in that questionnaire as being depleted leases.

Q. Now, just enumerate, please, what different records and data you studied in making this estimate.

A. I studied every single log that was on record with the Railroad Commission on every one of these leases of the Humble Company, and I have tabulated and I have in my work sheets the data pertinent to this issue that I have taken on these logs, that is, the top of the sand, the bottom of the sand, the position of the perforation of screen, which is a section through which these wells are producing, the percentage and behavior of the water in these wells taken from the water reports of the Bureau—of the Railroad Commission. I have picked all of the electrical well logs, what we call the Schlumbergers, had about a thousand logs at my disposal, and I took every single well that had a record within the vicinity or on this lease. Furthermore, in areas where there were no wells drilled sufficiently deep to give me positive figures as to the position of the water, I have gone to the record of wells drilled all around these leases, and I consider that as thorough a study as can be made.

Q. Did you also study and consider in your estimate the answers which the Humble Oil & Refining Company made to [fol. 595] the Commission in reply to this questionnaire that was sent out in August of last year?

A. Yes, sir, I have.

Q. Did you make an estimate of the depletion of the leases of the Humble Oil & Refining Company in acre-feet of net effective oil sand?

A. Yes, sir, I have.

Q. What estimate did you arrive at?

A. I have two estimates. I made one estimate based on the sand thickness that is shown by the Humble in the questionnaire, and from that derived the other factors. Of course, the top of the sand, I took that from the log. I have also prepared a calculation entirely independently of this, taking the thickness from the Railroad Commission map, and I wanted to satisfy myself to what extent there is a difference of opinion as to the sand, which is, of course, an important factor. Now, the calculation based on the Humble sand estimate added to 120,000 acre-feet depleted, and the calculation based on sand thickness taken from the Railroad Commission map adds about 118 and a fraction. The average of the two——

Q. You mean 118,000?

A. Yes, thousand acre-feet. The average of the two is 119,000, or I think the exact number is 119,035.

Q. Doctor, did you make your calculations prior to Mr. Moore's testimony in this case in which he gave some estimates?

A. Yes, sir.

Q. Do you recall what estimate Mr. T. V. Moore gave of the depletion of the Humble leases in acre-feet?

A. I didn't listen to the testimony, but I have had the transcript of his testimony, and if I recall right, it is 119,400 [fol. 596] acre-feet. I think that is a difference of three-tenths of one per cent.

Q. Have you figured out the depletion in acre-feet—or the percentage of depletion of the Humble Oil & Refining Company leases to the date of August 15, 1939, in acre-feet?

A. Yes, sir. That is, I took the figure for the total original acre-feet of the Humble, the figure that Mr. T. V. Moore had calculated. I have not made that calculation because, as I said, I did not calculate those leases that have not been depleted, and I didn't have the physical time to make one, and using that total, which is 707,700 acre-feet, the value of depleted sand in acre-feet of 119 represents about 16.82 per cent.

Q. Now Doctor, is it possible to arrive at a reliable figure as to the ultimate production from the leases of the Humble Oil & Refining Company, based on their depletion up to date, which you studied, of August 15, 1939?

A. Yes, sir.

Q. Up to that date?

A. Yes, sir.

Q. Is the method which you used in arriving at the figure, the estimate—or have you made an estimate of the ultimate production of the Humble Oil & Refining Company leases, based on that study that you have made?

A. Yes, I have.

Q. Is the method of calculation one which you consider to be an accurate and reliable method of calculation?

A. I consider it accurate, and I have used it frequently, and I consider it reliable.

Q. Will you state what is your estimate of the ultimate [fol. 597] recovery in barrels of oil from the Humble Oil & Refining Company leases in the East Texas field?

A. According to my calculations, it is 780,000,000 barrels.

Q. Do you know what figure the Humble gave as their estimate of the original amount of recoverable oil underneath their leases, what estimate they gave in this trial?

A. No, I don't. That would depend very much on what original per acre-foot they used, and I don't know what is the latest now, because you have the original volume of acre-feet, and if you multiply that by seven or eight or seven hundred, or various factors of original acre-foot, you would get different figures as to what would be the recoverable oil from those 707,000 acre-feet.

Q. Assuming a high recovery, assuming a thousand barrels per acre-foot recovery, what would be the production from their leases, or recovery from their leases, assuming one thousand?

A. That would be 707,000,000.

Q. Your estimate of the ultimate recovery is how many million?

A. It is 780.

Q. That is 780,000,000 barrels?

A. Yes, sir.

Cross-examination.

Questions by Mr. Baker:

Q. You mean the estimate of the original acre-feet—I mean the original recovery from Humble properties?

A. Not original recovery. That would be the Humble, if they would continue to produce the way they are, that would be what they would eventually get.

Q. Counting the original number of acre-feet that it had? [fol. 598] A. Counting the original acre-feet and the amount of oil that they have been producing right along as related to the per cent of sand depleted.

Q. Is that total estimated recovery or remaining estimated recovery?

A. No, that is the total. This is the total, ultimate.

Q. Now, Dr. Gardescu, what recovery figure did you employ per acre-feet?

A. I don't employ any recovery per acre-foot.

Q. Then how can you estimate the future recovery if you do not estimate how much the recovery will be per acre-foot?

A. In a field that is being drained, you can't use any such figure as recovery per acre-foot.

Q. After you get the figure all drained, if you had so many acre-feet to begin with, and you have no acre-feet left, and you recovered so much oil, can't you figure how much the recovery would be per acre-foot?

A. Yes, sir, if you work your yardstick. I have done that in all this work. That is, you figure out for the field as a whole how much has been depleted and how much has been produced, and you figure your yardstick, which is recovery per acre-foot depleted, and then you multiply that by the figure representing the total acre-feet that you have.

Q. Now, that is what I wanted to get at, Doctor Gardescu, what recovery figure did you use to multiply by the acre-feet in arriving at your result?

A. I took the relationship of depletion to recovery. Now, that does not mean that the acre-foot under the Humble lease will produce that much from that one-acre-foot. If you want to divide it that way, just take the recovery—[fol. 599] it means that with drainage towards the Humble lease and away from the Humble lease, on that basis the recovery would figure about for the Humble leases, 1,100 barrels per acre-foot.

Q. That is over-all?

A. Over-all for the Humble leases.

Q. 1,100 barrels per acre-foot?

A. Yes, sir.

Q. Now, then, have you figured how many barrels per acre-foot the drainage has been up to date on the Humble leases?

A. On the Humble leases?

Q. Yes, sir.

A. Yes, I have. How many barrels—how many acre-feet have been drained?

Q. Yes.

A. Well, that is 119,000 and a fraction.

Q. What is Humble's recovery up to date?

A. 131,000,000.

Q. 131,000,000?

A. Yes, sir.

Q. Now, what would be the recovery per acre-foot, assuming that 119,000 acre-feet is the number of the Humble acre-feet?

A. Well, that is just what we have been talking about. You divide 119 into 131, and that will give you 1,100.

Q. You were talking about the Humble recovery up to date?

A. Up to date and in the future.

Q. Well, I would like to separate that, if you please, Doctor. The answers are confusing to me.

Judge Sibley: To date is a fact, and in the future is a prophecy.

A. I have a chart that shows that what it is, it is a straight line. If you count on one side 119, put your percentage [fol. 600] depletion on one side and your recovery on your bottom line and put a point there that corresponds to 119,000 acre-feet, and that same point corresponds to 131,000,000 barrels, and then draw a line through that point, you will get your relationship.

Q. That is right. Just answer my questions as I propound them, and we will get along a little bit faster.

A. Yes, sir.

Q. You say that the Humble leases have been drained to the extent of 119,000 acre-feet?

A. That is right.

Q. You say the Humble leases have produced 131,000,000 barrels of oil?

A. That is right.

Q. Now, then, how many barrels of oil per acre-foot to date do you calculate the Humble leases have produced?

A. The Humble leases, based on their depleted acreage, have produced 1,100 barrels of oil.

Q. All right, to what extent has the field as a whole been depleted up to this date in acre-feet?

A. That would depend on how much the ultimate recovery of East Texas is going to be.

Q. Let's forget about ultimate recovery.

A. Well, now, how are you going to determine the depletion?

Q. Well, you just figure exactly the same way you did for the Humble property.

A. You give me two months' time. I have been here two weeks working day and night for these Humble leases, and using all of that data which is available. You give me time, and I will be very glad to do it.

[fol. 601] Q. Do you know how many acre-feet of sand were originally in the East Texas field?

A. No, sir, I don't know. That is, I know of the estimates, but I have not calculated it myself.

Q. You have not calculated that?

A. No, sir.

Q. Now, would you accept the Railroad Commission's figure?

A. Well, if I understand that, the Humble estimate and the Railroad Commission estimate as to the acre-feet comes pretty close, and we can start on that assumption, that it is a reasonable estimate.

Q. Well, let's take the Commission's figures.

A. All right, sir.

Q. Of about 4,962,000.

A. Four million, nine hundred sixty what?

Q. 62,000, approximately.

A. Yes, sir.

Q. 4,962,000.

A. Yes, sir, acre-feet, East Texas originally.

Q. Now, you said the Humble and the Railroad Commission original acre-feet figures were practically the same, did you not?

A. That is my recollection, that it is as close as calculations of that type can be gotten.

Q. Don't you think it would be reasonable, then, to take the Humble figures for the amount of acre-feet for the field which have been depleted?

A. I am sure the Humble must have worked that very carefully. If you want to use the Humble figures.

Q. The Humble figures 910,720 acre-feet of sand depleted for the field.

A. All right. Not depleted; you mean the original.

[fol. 602] Q. That is depleted up to date.

A. How much is depleted?

Q. No, that is the number of acre-feet that have been flooded by water, according to the Humble figures.

A. I am not going to accept the Humble's figure on that, because you say in the questionnaire a figure of 147,000 acre-feet, and I have calculated that to be 120 on one basis.

Q. Well——

A. Let me answer. You asked the question.

Q. Excuse me.

A. And 118,000, and then Mr. Moore comes and says it is 119, and the questionnaire shows 147. You place me in an embarrassing position to accept the figure.

Q. Dr. Gardescu, I am not talking now about the extent to which Humble Company's properties have been depleted.

A. No.

Q. I am talking about the extent to which the properties in the field as a whole have been depleted.

A. That is something that I would not accept a figure without going into it very carefully. I don't know what method the Humble has been using.

Q. If you were told that the Humble has an isopach map and from that isopach map it has computed its depletion up to date, and from the same isopach map it has computed the field depletion up to date, and its isopach map, its original isopach map is in substantial agreement with the Commission's——

A. The isopach map has very little bearing to the amount of depletion. That is the position of the water level in the various wells, and I have found great discrepancies between the actual facts as I have found out to be from the [fol. 603] logs and the Schlumbergers, and the assumptions made by the Humble.

Q. Now, Doctor, you said in the beginning that you were willing to accept the Humble Company's figures as to the original acre-feet?

A. Yes, sir.

Q. And you said they corresponded with the Commission's?

A. Yes, sir.

Q. You said that you were willing to take the Humble's figures likewise on the number of acre-feet remaining in the field?

A. No.

Q. As of that date?

A. No.

Q. What you really said was that you were willing to take the Humble Company's figures on the extent to which the field has been depleted in acre-feet of sand?

A. No, sir. We will have to go back through what I said to see. I don't recall having said that.

Q. Well, I am positive of it.

A. We agreed to the original.

Q. I am positive you did; if you will turn back and read it, you will find you said it.

A. If I did, I don't remember, because I don't have anything on this pad. I wrote the figures you gave me, and I don't have anything that would anywhere near come around what the remaining acre-feet is.

Q. I gave you the figure of 910,720 acre-feet as the Humble figure.

A. You gave me——

Q. Excuse me.

A. Yes, sir.

[fol. 604] Q. As the Humble figure outlining the extent to which the field as a whole has been depleted to date. Did you take that figure down?

A. What figure is that?

Q. 910,720 acre-feet.

A. No. I put in here 4,900,000 as against 4,960,000, thinking that was your figure of the original.

Q. Well, let's go ahead from here now, just taking that figure.

A. What figure?

Q. 910,720.

A. Why should I take that figure?

Q. Because that is the Humble's figure. I want you to do some calculating.

A. On the assumption of the Humble's calculations, I will be glad to, but I wouldn't vouch for it.

Q. That is all right. Just take that figure, if you please.

A. Let me get this right, because we might get mixed up again.

Q. Yes, sir.

A. 910,720 acre-feet is the depleted East Texas acre-feet, acre-feet depleted in East Texas as a whole?

Q. Yes, sir. Now, will you tell me, please, what the accumulated production from the East Texas field is up to date?

A. 1,370,000,000, is that right? You know those figures.

Q. That is approximately right, I think.

A. All right.

Q. Now, will you please calculate according to those figures how many barrels would have been recovered per acre-foot of sand depleted?

A. That—I don't have a slide rule, but 1,400 would be close enough. T. V. Moore there has that.

[fol. 605] Q. Wouldn't 1,499, or say 1,500 be about right, Doctor?

A. Yes, sir. Have you heard?

Q. Beg pardon?

A. I say have you heard of such a recovery? But I am not supposed to ask questions.

Q. They have already gone into that, Doctor. Now, subtract from the 1,500 the 1,100.

A. Listen, if any man came and told me to take 1,500 recovery and do something with it, I will take my hat and walk off. You are asking me something that is utterly unreasonable. In twenty years' evaluation, I have never heard of such a figure.

Q. Doctor, I will get around to that directly. Will you please make the subtraction?

A. All right, but we are playing with figures.

Q. No; the Court has heard a little more than you have, I believe.

A. All right, out of 15 what shall I take out?

Q. 1,100.

A. 1,100?

Q. Yes. Now, does that indicate that the field as a whole has recovered 500 barrels of oil per acre-foot more than the Humble Company has for the number of acre-feet depleted?

A. On these figures that is what it shows.

Q. 400?

A. 400, yes.

Q. Now, what percentage is that more per acre-foot?

A. Well, four divided by fifteen is about—how much recovery per acre-foot, do you want to give it as a base?

Q. I just want the percentage.

[fol. 606] A. You have to get the 400 in per cent of something else. I can't get 400 in per cent of nothing else.

Q. Find out what per cent 1,100 is of 1,500.

A. 1,100 of 1,500. You had better give me that slip stick. Eleven by fifteen is 73.3.

Q. All right. Then according to those figures, the Humble Company has recovered only 73.3 per cent as much oil per acre-foot as the balance of the field?

A. That is right.

Q. According to those figures?

A. That is right.

Redirect examination.

Questions by Mr. Hart:

Q. Dr. Gardescu, is an assumption of 1,500 barrels per acre-foot recovery in the East Texas field a reasonable assumption to make, in your experience?

A. That is most unreasonable I have used for years. If I didn't know just blindfolded like that and how much you would use. It is a standard 800, 700, something like that. It might be a little higher, or it might be a little lower, but I never heard to this day, I have never seen a figure that would come to 1,500 barrels recovery per acre-foot.

(Witness excused.)

* * * * * * * *

Mr. Hart: If the Court please, we wish to offer in evidence the order of the Railroad Commission dated July 13, 1939, and this spacing rule for East Texas that was offered before in the hearing at Houston on the temporary injunction where the injunction was denied.

[fol. 607] Judge Sibley: Should we know what it is? What did it provide?

Mr. Hart: It provided for the drilling of wells at a distance of 660 feet to any other completed or drilling wells, or 330 feet to any property, lease line or subdivision line without the necessity of getting a permit; closer than that with permit, providing the Railroad Commission could on its own motion hold hearing for permission to grant man to drill wells.

(The above referred to document was thereupon received in evidence and marked Defendants' Exhibit No. 15.)

Mr. Hart: We also offer certified copy of the order of August 26, 1935. I don't think there is anything I need to read to the Court at this time in connection with that. I want to offer it for the record, showing part of the orders of the Commission.

(The above referred to document was thereupon received in evidence and marked Defendants' Exhibit No. 16.)

Mr. Hart: May it be stipulated that none of the plaintiffs in this case have applied for or been denied by the Commission a right to drill any additional wells on their leases in the East Texas field?

Mr. Baker: No, sir, it cannot be stipulated, because the Commission has recently denied the Humble Company a number of applications for permits.

Mr. Hart: Well, you are not complaining of that in this case, are you?

Mr. Baker: We are not complaining, but I want to introduce a tabulation, since you have raised the question. I would like to introduce a tabulation showing exactly the [fol. 608] permit——

Judge Sibley: Just let him get through. The stipulation is denied. What next?

Mr. Hart: I think the pleadings speak for themselves on that. Will you stipulate with me?

Mr. Moody: No, but I will stipulate what the facts are, that Rowan & Nichols applied to the Railroad Commission for permit to drill their Todd "B" lease to the average density of the field, and that the Commission refused thirty-odd and granted one.

Mr. Hart: The Todd "B" is not in this case. If the Court please, in view of what Mr. Baker has said——

Judge Sibley: Let's keep it straight. Are you going to stipulate what he said?

Mr. Hart: No, sir.

Judge Sibley: All right, the slate is clean on stipulations.

STIPULATION

Mr. Hart: Mr. Baker, listen to this, please. Can you agree to this, that on August 16, 1939, the Commission called a hearing to determine whether or not additional wells should be given—additional permits to drill wells should be given to the Humble Oil & Refining Company on its leases in the East Texas field, and that at the same time the hearing on the adjustment of allowable on the Humble leases; that the hearing was held, evidence introduced on the application for an adjustment of allowable, and that at the conclusion of that the following statement was made by Mr. Taylor, and to which you made the following reply:

"The specific hearings ordered by the Commission to determine whether additional wells should be granted The [fol. 609] Humble Oil & Refining Company will be postponed to a future date, and a new hearing will be definitely ordered and notice given to all interested parties. Does the Humble have any objection?

"Mr. Baker: No, sir, we didn't call it, and you can postpone it forever so far as we are concerned." Do you agree that that transpired?

Mr. Baker: Yes, sir.

OFFER IN EVIDENCE

Mr. Hart: Now, there are one or two other places in this transcript, which I can't put my hands on them, where Mr. Baker stated to the effect that the Humble didn't want any more wells, hadn't applied for them, and didn't want to have a hearing on that as far as they were concerned. May I put those in evidence?

Mr. Baker: At that particular hearing?

Mr. Hart: Yes, sir.

Mr. Baker: That is right.

Note: The portions of the transcript above referred to are set out at pages 619 to 621 hereof.

Mr. Hart: May it be agreed that I may have those copies from here, and put them in evidence later?

Mr. Baker: Yes, sir.

Mr. Hart: All right.

Mr. Baker: Now, Your Honor, what he said there related to what we were seeking. We were not seeking more wells at the time, and we didn't ask for the hearing, but I want to introduce in evidence here a list, a tabulation which is certified to by the secretary of the Railroad Commission, showing the applications for permits to drill oil wells as exceptions to Rule 37, denied by the Railroad Commission, from January 1, 1938, through January 30, 1939.

Mr. Hart: If the Court please, we want to object to that, [fol. 610] because there has been no pleading here by the Humble that they have made no application that wells be granted, and no complaints made of any others of the Commission refusing them.

Judge Sibley: Of course, we are not trying that. It is sort of a reply to the contention that the remedy is more wells. I suppose it would throw such light on that as it will.

Mr. Hart: We except.

Judge Sibley: I will admit it for what it is worth.

Mr. Baker: This shows, Your Honor, that under Humble Oil & Refining Company, that fourteen applications of the Humble Oil & Refining Company for permit to drill addi-

tional wells in the East Texas field were denied by the Railroad Commission from October 29, 1938, to—no, from September 21, 1938, to sometime in March, 1939.

Mr. Hart: If the Court please, we further object to that, because there is no showing where those applications were made or what grounds the Commission had for refusing them, whether there has been any appeal taken to the Texas courts as provided by the statute in such cases. There is no showing of that at all.

Mr. Baker: Your Honor, this goes, of course, into the record for the purpose of showing the attitude of the Commission. Mr. Hart has asserted, or at least, the Commission has taken the position in this lawsuit, that the possible remedy is more wells, implying but not saying that the Commission would give more wells. This shows what they do.

Judge Sibley: I ruled on that part and let it in. The present objection is that it does not appear that the action is [fol. 611] final.

Mr. Baker: One who is denied a permit, of course, does not have to appeal, but he has the privilege of appealing.

Judge Sibley: I don't know what the lay may be about the exhaustion of the remedy.

Mr. Hart: Your Honor, the Commission's actions are prima facie valid.

Judge Sibley: Of course, that is true of all actions of the Commission; presumptively, they are right. That is true of the one we are dealing with here. I suppose if the secretary certifies that those applications were made and denied, that is a fair presumption that they ended right there.

Mr. Baker: Yes, sir, that is true.

Judge Sibley: I think it may go in.

Offer in Evidence

Mr. Hart: Now, in view of that, we want to offer a tabulation showing permits to drill wells as exceptions to Rule 37 that have been granted to the Humble Oil & Refining Company up to February 12, 1940.

Judge Sibley: Is there any objection to that?

Mr. Baker: No, sir.

Judge Sibley: How many of those are there?

Mr. Baker: Except we don't think it is material or relevant to any issue we have raised in the case at all.

Judge Sibley: Maybe not.

Mr. Hart: We put this in defensively on account of th issue he raised. Now, we haven't raised the issue, and don't know why that is pertinent.

Judge Sibley: Well, I don't know whether it will help u any or not, but I will let it go in.

[fol. 612] Mr. Hart: It shows that out of the 2454 well drilled by the Humble Company on its East Texas leases 1527 have been drilled under exceptions to Rule 37.

Judge Sibley: Does it contain any recent allowances?

Mr. Hart: I don't think the defendants appear on here

Judge Sibley: All right.

Mr. Hart: No, they don't. I couldn't get that account without having a search made of the records.

Judge Sibley: Well, what next?

Mr. Hart: The defendants rest, Your Honor.

Judge Sibley: Anything further, Mr. Baker?

Mr. Baker: No, sir.

Judge Sibley: Anything further, Governor Moody?

Mr. Moody: Yes, sir, I would like to ask the Attorney General if we can make a stipulation, subject to its being material, and that is prior to filing—prior to the Rowan & Nichols suit that is reported in the 28th Federal—I don't recall the volume and page of the report with the Circuit Court of Appeals in it, Rowan & Nichols applied for an adjustment of the allowable on its Todd "B" lease, or in the alternative for wells 6 to 25, inclusive, and that the Railroad Commission granted well 6 and refused wells 7 to 25, inclusive, and that while it has not applied for any additional wells on the Todd "A" lease prior to the filing of this suit, it did apply for an adjustment of allowables on this lease, and the Commission has not granted the application, and here is a copy of them, Mr. Hart. Can we make that stipulation?

[fol. 613] Mr. Hart: I think that is wholly immaterial, because there is no showing that they made seven applications on the leases injured in this case.

Judge Sibley: I knew that already. Hasn't somebody proved it already?

Mr. Moody: I don't think we proved it, Your Honor. I think the Court read that somewhere else in another lawsuit.

Mr. Hart: That relates to the lease involved in the other case.

Judge Sibley: Well, I saw they had been granted one and refused the others.

Mr. Hart: That is in another case. On this lease they have seven wells on 28 acres, and they haven't applied for any more, and haven't been refused any more.

Mr. Moody: That is correct. We haven't applied for any on the Todd "A" lease since the seventh well was drilled on it in 1934, and we have offered testimony that this is ample to——

Judge Sibley: Well, he won't stipulate, so that disposes of that.

Mr. Moody: Well, I understand he just objects to it on the ground that it is immaterial.

Judge Sibley: Well, there has been no relief asked for on those wells. It just shows the policy of the Commission. It might have some bearing on their idea of what your remedy is. I will admit it, but frankly, I don't see where it will help you.

Mr. Moody: Yes, sir, but I don't know what its value is in deciding the issues of the case. Now, I would like to recall [fol. 614] Mr. Buck for just four or five questions, and I think that will be all I will have.

Judge Sibley: All right. Now, please don't plow the old furrows, gentlemen.

Mr. Moody: I will try not to, Your Honor. The purpose I have here is to show the effect——

Judge Sibley: Just ask the questions.

Mr. Moody: Very well.

E. O. Buck, having been recalled to the witness stand as a witness on behalf of the plaintiff Rowan & Nichols Oil Company, testified as follows:

Direct examination.

Questions by Mr. Moody:

Q. Mr. Buck, will you explain this instrument marked by the Reporter Rowan & Nichols' Exhibit 29?

A. Rowan & Nichols Exhibit 29 is a *to* scale cross section of the East Texas field on a line just south of the Rowan & Nichols Todd "B" lease that goes from west to east. It is drawn to a scale of—horizontal scale of one foot

to—one inch to 3,000 feet, and a vertical scale of one inch to 40 feet. By planimeter measurement, the volume of the section has been determined, and by making a 3,000 foot sub-division or a one square inch sub-division in the area, the volume has been computed. By producing or assuming equal withdrawal across each section, the production from each section and the loss or gain of each section is shown in the percentages in the cross section.

Q. All right. Do the bottom figures here, minus one per cent west minus 35 per cent, and showing all over here to the east plus 560 per cent, does that show the per cents of [fol. 615] recovery or losses from these several sections under an equal taking of oil clear across the field?

A. It does.

Mr. Hart: May I ask a question for the purpose of an objection?

Mr. Moody: Yes, sir.

Examination.

By Mr. Hart:

Q. Mr. Buck, when you speak of equal taking, you mean a per well recovery—that is, each well in the field producing the same amount of oil?

A. On that particular cross section, yes, sir.

Q. In other words, there is no distinction between the amount now in a well in the fairway or a well on the east side or a well on the west side?

A. There is none on that cross section.

Mr. Hart: Well, we wish to object to that, because it is not relevant to the order here under attack, and because it assumed a situation that does not exist here at all.

Judge Sibley: How about that, Governor?

Mr. Moody: The purpose of it, Your Honor, is to demonstrate a fact of physics that with the oil being moved forward and up structure by the water, that if you take equal takings clear across the field, that the result of it is not to benefit the man on the west, but to take the oil to replenish the man at the far extreme east so that for the western half of the field, as are shown by that map that had the neutral line through it, as shown by that, that east of that line—west of the line there would be, as the result of taking 20 barrels per well, a loss of oil to those parties, that over

to the far east they would produce some four or five times——

[fol. 616] Judge Sibley: That is just so evident that if that happens that that result follows, that there is no use of proving it.

Mr. Moody: That is all right. I wanted to analyze the instrument. That is all I care to offer.

Judge Sibley: Anything further from Mr. Fischer?

Mr. Saye: No, sir.

Judge Sibley: All right. Go ahead with the arguments.

Mr. Baker: First I want to ask, Mr. Hart, if you will stipulate for the record that the original Rule 37 provided for 150 foot spacing from property lines, and 300 foot spacing from other wells.

Mr. Hart: Now, Mr. Baker, I think that is substantially correct, but I would much prefer not to stipulate that; let you just introduce the order; you can get a copy of it and introduce it later if you want to.

Mr. Baker: Very well.

Mr. Hart: I think it is much more satisfactory to have the actual order in without stipulating what it is about.

Mr. Baker: All right, I wish to introduce a certified copy of the Railroad Commission's ten acre spacing order of September 2, 1931, for the East Texas field, and wish particularly to call attention to this finding of fact. "It appearing from the evidence that the spacing of wells in said East Texas field, under the terms and provisions of the Railroad Commission's oil and gas conservation, Rule 37 threatens to cause actual physical waste due to the too rapid dissipation of gas energy in the productio . of oil and also due to [fol. 617] the too rapid encroachment of water, that in the interest of preventing actual physical waste of oil and gas in said East Texas field, it is desirable to modify said Rule 37 as applied to said field. Therefore, it is here now ordered by the Railroad Commission that said Rule 37, in so far as it applies to the East Texas field, be modified, and the following rule is provided." And then it proceeds to provide for 330 and 660 foot spacing.

(Thereupon, the certified copy of the Railroad Commission's order above referred to was marked as Humble Oil & Refining Company's Exhibit No. 34.)

Mr. Baker: Now, Your Honor, I wish to introduce certified copy of the Railroad Commission's order of March 23,

1936, which contains, among other things, the following: "Whereas, the Railroad Commission's special order fixing allowable production of crude oil in the various fields and districts in Texas, dated August 26, 1935, contains the following language: 'We further find from the evidence the more wells that are drilled, the greater will be the ultimate recovery of oil and gas from any given pool.'

By this language the Commission did not mean and did not find from the evidence that the closer wells are drilled the greater will be the ultimate recovery of oil and gas from any given pool, but by such language only meant and found from the evidence that the more wells that are drilled *in conformity with the spacing rules* as applicable to the various fields in Texas the greater will be the ultimate recovery of oil and/or gas from any given pool."

(Thereupon, the certified copy of the Railroad Commission's order above referred to was marked as Humble Oil & Refining Company's Exhibit No. 35.)

[fol. 618] Mr. Baker: Now, I wish to introduce a certified copy of the Railroad Commission order of February 24, 1936, containing the same recitals.

(Thereupon, the above order of the Railroad Commission above referred to was marked as Humble's Exhibit No. 36.)

Mr. Baker: May I inquire, Your Honor, how much time will be allowed for argument?

Mr. Saye: Mr. Baker, I want to ask one question. Did you introduce the order explanatory of the order of August 26, 1935—did you also introduce the order of August 25?

Mr. Baker: No, sir, I did not, but this contains excerpts from it.

Mr. Saye: Your Honor, I would like to introduce that in.

Mr. Hart: I have offered that, Mr. Saye.

Mr. Saye: Oh, have you offered that?

Mr. Hart: I intended to.

Judge Sibley: I think you did.

Mr. Hart: I think I did; that is the other I intended to offer.

Mr. Saye: All right.

Close of Testimony.

[fol. 619] EXCERPTS FROM TRANSCRIPT OF TESTIMONY AND PROCEEDINGS AT HEARING HELD BY RAILROAD COMMISSION OF TEXAS ON AUGUST 16, 1939—INSERTED HERE AS PER AGREEMENT OF COUNSEL SHOWN ON PAGE 609 HEREOF

Mr. Baker: Mr. Chairman, may I ask a question before we proceed any further? As I understand you gave two notices——

Chairman Smith: I am going to announce these notices now. The first is Oil & Gas Docket No. 120, #6-829, notice of hearing pertaining to the application of Humble Oil & Refining Company for an increase in allowable on its wells, —on its lease and wells in the East Texas Field. That is the application we will hear first.

The second is Docket No. 120, #6-818, under the conservation and prevention of waste of crude petroleum and natural gas in the East Texas Field.

Mr. Baker: Will you please state what was the purpose of that last notice, the last hearing that you called?

Chairman Smith: You mean the one that I read last?

Mr. Baker: Yes, sir.

Chairman Smith: (Reading) "Under and by virtue of the authority granted the Railroad Commission of Texas by Article 6049c of the Revised Civil Statutes of the State of Texas and the order of the Railroad Commission relative to the spacing of wells in the East Texas Field of July 13, 1939, it is hereby ordered that notice be and is hereby given to all interested parties in the State of Texas and particularly in the East Texas Oil Field comprizing all oil producing land in Gregg, Smith, Rusk and Upshur Counties, that the Railroad Commission of Texas will at 10 A. M., Wednesday, August 16, 1939, at the Austin Hotel at Austin, Texas, hold a hearing for the purpose of hearing evidence [fol. 620] and in order to determine whether or not waste (as defined in the statutes of this state) of crude oil or natural gas is reasonably imminent or is taking place in the East Texas Oil Field, and for the purpose of hearing evidence and in order to determine whether permits for the drilling of additional wells on the hereinafter described leaseholds in the East Texas Field should be issued or granted by the Commission to prevent waste and or the confiscation of property." And this deals only with the leases that the Humble Oil & Refining Company have in these counties mentioned.

Mr. Madden Hill: Mr. Chairman, I would like to enter an appearance on behalf of a group of East Texas operators.

Mr. Baker: Our application was for an adjustment of the allowable in the East Texas Field. The only purpose of this hearing, as I understand, is to hear evidence on our application. The other hearing, as I understand it, is a hearing called by the Commission on its own initiative in order to determine whether or not it wishes to grant more permits to the Humble Company to drill wells on its leases in the East Texas field.

Chairman Smith: You are correct in your presumption.

Mr. Baker: Yes, sir. Now, with respect to the last; first, I would like to say this, that it is our position that one well will effectually drain more than ten acres in the East Texas Field. That we have drilled our properties to an average of one well to 5-8/10 acres; that we have drilled each and every one of our properties below ten acres,—below a ten acre density. That we do not need any more wells on our properties in the East Texas Field in order to produce the [fol. 621] oil under our leases without waste. That if the Commission will adjust the allowables from our wells in a proper amount, we will be able to recover all of our fair share of the oil from the East Texas fields without the necessity of drilling another well in that field on a single one of our properties. And, therefore, since this is the Commission's hearing on that proposition, we suppose that the Commission will assume and carry forward the burden of proof, and we have no evidence to introduce on that issue at all. We don't want the wells; we don't want the permits, because, as I said, we don't need them, and the only evidence that we expect to introduce on that issue at the present is to show that one well will effectually drain ten acres of land, but I believe it would be in order for the Commission, on that part of the hearing, to put on its own evidence, that is, the burden of proof.

Chairman Smith: The Commission is going to take the position that this first application be heard, Docket No. 6-829, conservation and prevention of waste of crude petroleum and natural gas in the East Texas Field as pertains to the Humble Oil & Refining Company leases.

Mr. Baker: Hearing our motion, is that it?

Chairman Smith: That is the first thing we will do, to hear your motion.

[fol. 622] Reporters' Certificate to foregoing transcript omitted in printing.

[fol. 623] PLAINTIFF'S EXHIBIT "A"

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF TEXAS, AUSTIN DIVISION

Civil Action No. 31

HUMBLE OIL & REFINING COMPANY, Plaintiff,

vs.

RAILROAD COMMISSION OF TEXAS, ET AL., Defendants

Stipulation No. 1

The parties hereto stipulate as follows:

1. That for a few days after the decree of August 12, 1939, granting to Plaintiff a preliminary injunction in this action, was entered, the Plaintiff produced its wells in the East Texas Field as provided in that decree. The order of the Railroad Commission of Texas of June 19, 1939, and the schedule issued in connection therewith are no longer in effect. The Defendants state in open court that they will never seek to enforce against Plaintiff any fines, penalties or forfeitures, or take any other action against Plaintiff because of its having produced oil from its wells in the East Texas Field to the extent that it was permitted to do so under the terms of said decree.

2. That since the hearing on Plaintiff's Second Motion for Preliminary Injunction, the Defendant, Railroad Com- [fol. 624] mission of Texas, has entered a proration order under date of January 24, 1940, effective for the month of February, 1940, has issued a schedule in connection therewith, and has issued another order shutting down the East Texas Field for twelve (12) days during the month of February, 1940—all of which are substantially the same as the orders of September 11 and 29, 1939, and the schedules issued in connection therewith and the shut-down orders issued on the same dates relating to the East Texas Field, except that the shutdown order does not apply to wells which are classed as marginal wells by the Railroad Commission of Texas. The parties hereto agree that the pleadings heretofore filed in this action shall relate to said orders and schedules of January 24, 1940 and any and all other orders of substantially the same effect that may be issued by the Railroad Commission of Texas in the future,

and that no further pleadings shall be required in order to render such additional orders and schedules subject to the final judgment that may be entered in this action.

Executed at Austin, Texas on this, the 13th day of February, A. D., 1940.

(Signed) Rex G. Baker, Attorney for Plaintiff.
(Signed) James P. Hart, Attorney for Defendants.

(Endorsed:) No. 31 Civil Action In the District Court of the United States for the Western District of Texas, Austin Division Humble Oil & Refining Company Plaintiff vs. Railroad Commission of Texas et al. Defendants Stipulation No. 1 Filed 13th day of February, 1940 Maxey Hart, Clerk. (Signed) by Joe Steiner, Deputy.

[fol. 625] PLAINTIFFS' EXHIBIT No. 7

Tabulation Showing Varying Density to Which East Texas Field is Drilled (January 1, 1939)

Acres	Wells	Acres per Well	Average
109	360	.1 to .4	.3
374	523	.5 to .99	.71
2013	1336	1. to 1.9	1.5
5637	2237	2. to 2.9	2.5
30160	7331	3. to 4.9	4.1
57448	9849	5. to 6.9	5.85
37159	4128	7 and above	9.
132900	25764		

Endorsed: No. 31 Civil. Filed 13th day of February, 1940. Maxey Hart, Clerk. (Signed) Maxey Hart. Pltffs Ex. 7.

[fol. 626] PLAINTIFF'S EXHIBIT No. 8

RAILROAD COMMISSION OF TEXAS, OIL AND GAS DIVISION

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 and 146

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, September 11, 1939.

SPECIAL ORDER FIXING THE ALLOWABLE PRODUCTION OF CRUDE OIL IN THE EAST TEXAS FIELD FOR THE MONTHS OF SEPTEMBER AND OCTOBER, 1939, AND AMENDING RULE 23, DIVISION 3, OF THE COMMISSION'S ORDER OF OCTOBER 17, 1933, PERTAINING TO THE EAST TEXAS FIELD

Whereas, The Railroad Commission of Texas, after due notice and hearing on October 17, 1933, promulgated a gen-

eral order pertaining to the conservation and regulation of crude oil and natural gas for the State of Texas, which included Rule 23 of Division 3, pertaining to the East Texas Field, which provided in part that each oil well in the East Texas Field should be allowed to produce daily a certain maximum percentage of its hourly potential capacity as determined by the Commission, and

Whereas, The Commission through subsequent amendments to Rule 23, of Division 3, of the Order of October 17, 1933, has continued to distribute the allowable for the East Texas Field between producing wells on the basis set forth in said Rule, and

Whereas, The method of allocation of the allowable production of the East Texas Field has been recently attacked in the Courts and the Commission has been restrained from enforcing the provisions of said Rule as it applies to certain properties in the East Texas Field, and

Whereas, The Commission finds that it is necessary to revise the method of allocation and distribution of the [fol. 627] allowable oil in the East Texas Field as has been enforced and applied and to amend Rule 23 of Division 3 of the Order of October 17, 1933, in order to conform to certain standards of distribution of the allowable crude oil production between the wells in the East Texas Field as indicated as being necessary by the Courts, and

Whereas, The Commission, after due notice, held a hearing in Austin, Texas, called for August 16, 1939, relating to the conservation of crude oil and natural gas in the East Texas Field and the prevention of the waste thereof, at which hearing the Commission heard extensive testimony on the proper factors which should be included in an equitable distribution of the allowable production between the producing wells in the East Texas Field and regulations necessary for the prevention of waste in said Field, and

Whereas, The Commission finds from the evidence submitted at its hearings that in order for each producing well to be allowed to produce its fair share of the allowable oil from the East Texas Field, that the method of allocation and distribution of the field's allowable between producing wells in this field should, in order to prevent waste, incorporate a minimum well allowable, the potential capacity of the wells on each lease, the number of acre feet of oil saturated sand underlying the wells on each tract and the bottom-hole pressure of the wells located on each tract, and

Whereas, The Commission finds from evidence submitted to it at numerous hearings, including the hearing of August 16, 1939, that the reservoir of the East Texas Field has its energy principally supplied by a hydrostatic drive which [fol. 628] encroaches from the west to the east and that only a certain amount of crude oil can be withdrawn daily from the East Texas Field in order to utilize effectively the energy necessary to recover the greatest amount of oil ultimately from the reservoir, and

Whereas, The Commission finds that in order to prevent waste in said field that the allowable production during the months of September and October, 1939, should not average more than 490,000 barrels per day over a thirty (30) day period, and that not more than 690,000 barrels of crude oil should be produced from the East Texas Field in any one day during the months of September and October, 1939, and

Whereas, The Commission finds that there exists a market demand for crude oil produced in such an amount in the East Texas Field during the months of September and October, 1939:

It is Therefore Ordered That Rule 23, of Division 3, of the Commission's Order of October 17, 1933, pertaining to the East Texas Field be and it is hereby amended to read, effective September 14, 1939, as follows:

"Rule 23. (a) Not more than 690,000 barrels of crude oil shall be produced from the East Texas Field during any day of the effective period of this Order.

"(b) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) [fol. 629] barrels per day.

2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce daily that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels.

3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of

producing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deductions for one (1) and two (2) above have been made, that the product of such well's hourly potential by its bottom-hole pressure by the thickness of the saturated Woodbine Sand underlying the well by the average number of acres per well in the lease bears to the sum of such products for all of the wells in the field."

It is Further Ordered by the Railroad Commission that the owner of any oil and/or gas leasehold estate in the East Texas Oil Field shall have the right to present evidence to the Commission and be heard thereon on the question of the amount of acreage owned, the potential of his well or wells thereon, or the bottom-hole pressure or pressures of any well or wells on said leasehold estate, or the number of feet of saturated oil sand underlying any of said leases.

It is Further Ordered That this Cause be held open on the Docket for such other and further orders as may be necessary and supported by evidence of record.

Railroad Commission of Texas, Lon A. Smith, Chairman, Jerry Sadler, Commissioner. (Seal.) Attest: C. F. Petet, Secretary.

[fol. 630] I, C. F. Petet, Secretary of the Railroad Commission of Texas, do hereby certify that the attached instrument, being a mimeographed copy of the Commission's Order entitled "Special Order Fixing the Allowable Production of Crude Oil in the East Texas Field for the Months of September and October, 1939, and Amending Rule 23, Division 3, of the Commission's Order of October 17, 1933, Pertaining to the East Texas Field," dated September 11, 1939, is a true and correct copy of the original now on file in these offices and in my custody as Secretary of said Commission.

Witness My Hand and the Seal of the Railroad Commission of Texas This the 11th day of October, 1939.

(Signed) C. F. Petet, Secretary of the Railroad Commission of Texas. (Seal.)

[fol. 631] PLAINTIFFS' EXHIBIT No. 8-A

Railroad Commission of Texas Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 and 146

20-908

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas
September 29, 1939.

Special Order Fixing the Allowable Production of Crude Oil In the Various Fields and Districts in Texas

Whereas, After due notice, hearings have been held in Austin, Texas, at various times, including the hearing on September 11, 1939, with respect to the existence and imminence of waste of oil and gas in the state of Texas, and the prevention thereof; and

Whereas, In view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders and

Whereas, The Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning o'clock a. m., October 1, 1939, until 7 o'clock a. m., November 1, 1939; and

Whereas, The Railroad Commission of Texas finds that waste exists and is imminent and that to prevent such waste of oil and gas as the same is defined by the applicable Statutes, it is necessary to restrict the production of oil in the state of Texas to the reasonable market demand

[fol. 632]

Therefore, It Is Ordered That beginning at 7 o'clock a. m. October 1, 1939, and until 7 o'clock a. m., November 1, 1939

the production of oil in the state of Texas and the various fields shown, shall be as hereinafter shown Except as provided for in the Commission's Order of September 29, 1939, entitled "General Order Shutting Down All Oil Wells in the Various Fields and Districts in the State of Texas."

Rule 2 of Division 2, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than Eighty Eight Thousand Two Hundred and Forty-One (88,241) barrels of crude oil shall be produced from said district during any day of the effective period of this Order. Moore County shall not produce in excess of One Thousand Seven Hundred Twenty One (1,721) barrels of oil daily. Moore County allowable is in addition to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of Six Hundred Eleven (611) barrels daily. The Osborne Area allowable is in addition to the Panhandle allowable.

Rule 23 of Division 3, as contained in an Order of the Commission dated October 17, 1933, pertaining to the East Texas Field as amended by an Order of the Commission dated September 11, 1939, is hereby readopted and amended as follows:

Whereas, The Commission finds that in order to prevent waste in said field that the allowable production during the [fol. 633] month of October, 1939, should not average more than 490,000 barrels per day over the thirty-one (31) day period, and that no more than 690,000 barrels of crude oil should be produced from the East Texas Field in any one day during the month of October, 1939, and

Whereas, The Commission finds that there exists a market demand for crude oil produced in such an amount in the East Texas Field during the month of October, 1939:

It Is Therefore Ordered That Rule 23, of Division 3, of the Commission's Order of October 17, 1933, pertaining to the East Texas Field be and it is hereby amended to read, effective October 1, 1939, as follows:

"Rule 23. (a) Not more than 690,000 barrels of crude oil shall be produced from the East Texas Field during any day of the effective period of this Order.

(b) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) barrels per day.

2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce daily that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels.

3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of pro- [fol. 634] ducing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deductions for one (1) and two (2) above have been made, that the product of such well's hourly potential by its bottom-hole pressure by the thickness of the saturated Woodbine Sand underlying the well by the average number of acres per well in the lease bears to the sum of such products for all of the wells in the field."

3. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the North Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Twenty Eight Thousand Five Hundred and Fifty Six (128,556) barrels of crude oil shall be produced from said district during any day of the effective period of this Order.

4. Rule 2 of Division 6, as contained in an Order of this Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Sixty-Four Thousand Eight Hundred and Ninety (64,890) barrels of crude oil shall be produced from said district during any day of the effective period of this Order, which is distributed in the following manner:

District No. 7-B

Brown County	1981	Coleman County	1209	Shackelford County	5958
Callahan County	1339	Novice Field	165	Stribling Field	98
Scranton Pool	81	Comanche County	381	Stonewall County	
Haskett County	93	Eastland County	2832	Boyd Field	50
Jones County	6190	Erath County	77	Carlisle Field	100
Akard Field	87	Fisher County	3452	Taylor County	129
Ivy Field	2436	Appling Field	116	Bowles	108
Stephens County	4124	Avoca Field	2160	Throckmorton County	427
Loving Field	45	Griffin Field	2627		
		Hawley Field	604		
[fol. 635]		Palo Pinto County	481		

District No. 7-C

Crockett County:		Page	60	Upton County:	
Crockett Pool	596	Reagan County:		Herrington Extension	86
Simpson Pool	21	Big Lake Field	6480	Hurdle Field	121
World Pool	1058	Grayson	151	McCamey Field	18729
Irion County	28	Runnels County:		Webb Ray Field	37
McCulloch County	1	Beddo Field	35		
Opp	50	McMillan Field	87		

Rule 4 of Division 7, as contained in an Order of the Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

Rule 4. Not more than Three Hundred One Thousand Five Hundred Thirty Two (301,532) barrels of crude oil per day shall be produced from said district during any day of the effective period of this Order, which shall be distributed to the various fields therein as follows:

Anthony	28	Magnolia Sealy	701	Foster	12685
Apco	100	Mason	457	Fromme	110
Bennett	5426	Masterson	386	Fuhrman	2045
Carter	36	Means	3876	Garza	15
Church Fields	7097	McClintic	1731	Goldsmith	35781
Cowden, North	14937	Monroe	50	Gulf-McElroy	7394
Cowden, No. Deep	50	Moore	67	Halley	534
Cowden, Scuth	317	Sand Hills (Permian)	1689	Hendrick	9890
Cowden, Crane	1470	Sand Hills (Ordovician)	277	Harper	6445
Dane	779	Scarborough	2128	Netterville	224
Dean	120	Seminole	602	Northwest	435
Deep Rock	264	Shearer	1575	Parker	33
Dobbs	9	Shipley	1788	Payton	6383
Duggan	1752	Slaughter	5936	Pecos Valley (High Gravity)	1568
Edwards	10	Snyder	2755	Pecos Valley (Low Gravity)	674
Emma	1261	Taylor-Link	1640	Penwell	5802
Emperor	2173	Tobarg	1905	Richards	20
Henderson	3400	Waddell	2310	Westbrook	951
Howard-Glasscock	16460	Ward, North	8685	Wheat	1597
Iatan E-Howard	5915	Ward, South	8486	White-Baker	158
Johnson	108	Wasson	23904	Yates	35303
Jordan	4562	West	37	Yates (Smith Sand)	150
Kermit	19009	[fol. 636]		Waples-Platter	50
Keystone (Colby)	3631				
Keystone (Lime)	2714	Estes	10029		
Leck	309	Eaves	293		
Lehn	41				

6. Rule 2 of Division 4, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Twenty Two Thousand Four Hundred and Thirty Five (122,435) barrels of crude oil per day shall be produced from said district during any day of the effective period of this Order. Said amounts shall be allocated to the various fields in the following amounts:

District No. 5

Bazette	50	Mexia	1726	Rowe and Baker	140
Buffalo	50	Negro Creek	3	Sulphur Bluff	5183
Bolivar	13	Opelika	22	South Bosque	24
Collinsville	22	Pottsboro	5	Van	23732
Corsicana Shallow	401	Powell	1922	Van Shallow	117
Currie	112	Rice	3	Wortham	77
Flag Lake	625	Richland	15	Wortham Shallow	8
Lott	17				

District No. 6

Boggy Creek	359	Long Lake	3337	Potter	105
Cayuga	17133	Lone Star	54	Percilla	15
Cayuga Trinity	18	Marion Shallow	40	Rodessa	29515
Ginter	37	Navarro Crossing	840	Talco	35813
Grapeland	86	Nacogdoches	14	Trinity	671
Huntington	6	Panola	29	Waskom	96

[fol. 637] 7. Rule 2 of Section "A" of Division 8, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Three Hundred Eighteen Thousand Seven Hundred Ninety Eight (318,798) barrels of crude oil shall be produced in said district during any day of the effective period of this order and same shall be distributed as follows:

Division I.

Alta Vista	82	Dale	331	Larremore	112
Bateman	117	Deupree	22	Loma Alto	5
—New Berlin	4	Dale West	103	Luling Branyon	10460
Bob Rose	4	Dimlay	1	Lytton Springs	357
Burdette Wells	4	Dunlap	154	Manford	27
Buchanan	184	Eckert	111	Matthews	25
Calliham	226	Ellison Young	76	Munson	246
Carroll	14	Espada Mission	1	Minerva Rockdale	184
Cedar Creek	50	Fairfield	13	Noack	93
Cedar Creek No.	8	Essell	3606	Pearsall	673
Carver-Kallison	15	Gas Ridge	8	Philtop	4
Chapman Abbott	266	Hilbig	396	Red Rock	100
Chicon Lake	27	Jacobs	553	Riddle	93
Clark	194	Jones	1	Salt Flat	6466
Darst Creek	10715	Kimbro	10	Salt Flat Np	75

Division I (Continued)

Somerset	609	Taylor Ina	34	Yoast	37
Southton	61	Thrall	30	Zobrosky	97
Spiller	12	Von Ormy	170		
Staples	1	Walnut Creek	34		37300

Division II

Burnell, South	800	Mt. Lucas	48	Tulsita	17
Cordell	3960	Mission River	517	[fol. 638]	
Caesar	206	Normanna	51		
Coleto Creek	421	O'Connor		Heyser	13194
Diamond Half	250	McFaddin	120	Holzmark	27
Dinero	18	Oakville	462	Hordes Creek	30
Dirks	2241	Plummer	298	Keeran	925
Francitas	300	Ray	250	Pettus	717
Ganado	39	Sarco	3	Pettus, New	903
Greta Deep	313	Slick		Placedo	7851
Greta	6934	New Refugio		Placedo, East	426
La Rosa	4752	Refugio Fox	814	Voss	10
Maurits	150	Old Refugio	1362	White Creek	165
McFaddin	2997	Tom O'Connor	16266	West Ranch	1406
McMurray	4	Telfner, East	21		
McNeil	66	Tuleta	215		73759
Mellon Creek	387				

Division IV

Adami	25	Escobas	1457	Peters	88
Agua Dulce	193	Fitzsimmons	3400	Piedras Pintas	40
Albercas	50	Flour Bluff	4942	Premont	461
Alfred	272	Govt. Wells No.	8146	Premont East	185
Alta Verde	6	Govt. Wells So.	3910	Rancho Solo	414
Angelita	11	Guerra	583	Rancho Solo Ext.	335
Alice	3335	Henne-Winch-		Randado	286
Alta Mesa	541	Farris	9	Reynolds	870
Aviators	350	Jennings	1176	Rio Grande City	103
Aransas	13085	Kingsville	62	Roma	6
Baldwin	487	Kohler	82	Ricaby	150
Barbacoas	7	Kohler Deep	33	Richard King	1289
Benavides	9389	Hoffman	6124	Rincon	60
Ben Bolt	561	Killam	701	Riverside	176
Bird Island	0	Killam North	222	Robstown	88
Blanchard	65	Kelsey	2035	Sandia	11
Bruni	545	Labbe	265	Sam Fordyce No.	237
Camada	18	Laurel	17	Sam Fordyce	3641
Captain Lucey	141	Las Animas	80	Sarnosa	632
Carolina-Texas	7	Loma Novia	12658	Saxet	14897
Casa Blanco	576	Loma Vista	7	Saxet Frio	13101
No. Casa Blanca	140	London	43	Seven Sisters	8337
Cedro Hill	340	Longhorn	1600	Seven Sisters So.	1081
Charco Redondo	19	Los Olmos	118	Sinton	9
Charamousca	423	Lopes	6697	Southland	58
Chiltipin	31	Luby	10177	Sullivan	35
Clark-Muil	80	Luby North	77	Sullivan City	133
Cole West	515	Lundell	898	Sweden	108
Colorado	497	Magnolia City	60	Sun	675
Colmena	331	Mathis, East	50	Taft	4597
Clara Driscoll	2596	Midway	790	Tom Graham	1894
Clara Driscoll So.	1408	Minnie Bock	633	Tesoro	200
Conoco Driscoll	2187	Miranda City	398	Turkey Creek	5193
Comitas	976	Mirando Valley	1210	Volpe	140
Corpus Christi	1717	Moca	370	White Point	102
Cuellar	115	Nelson	2	East White Point	10369
Driscoll Ranch	64	O'Hern	5888		
Eagle Hill	933	Oilton	1295		207739
El Tanque	419	Piedre Lumbre	1986		
East Bruni	220	Plymouth	16772		

[fol. 639] 8. Rule 2 of Section A, Division 9, as contained in an Order of the Commission dated October 17, 1933, pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than Two Hundred and Ninety Eight Thousand Nine Hundred Twenty-Eight (298,928) barrels of crude oil shall be produced from said district during any day of the effective period of this Order, which shall be distributed as follows:

Aldine	100	Hankamer New	212	Sandy Point	69
Amelia	3424	Hardin	8660	Satsuma	406
Anahuac	10235	Hastings	28510	Schwab	58
Allen Dome	5	High Island	2338	Schwab-Wilcox	300
Ariola	310	Hilje	33	Seabreeze	306
Armour	312	Hull Old	2072	Segno	1759
Beaumont, West	4039	Hitchcock	1145	Segno Deep	2053
Barbers Hill	9065	Hull New	4286	Silsbee	1962
Batson, New	1574	Joe's Lake	1620	Sour Lake	1512
Bammel	100	Houston, No.	300	Spindletop	2934
Batson Old	693	Houston, So.	3688	South Liberty	500
Bay City	3710	Humble	3742	Sugarland	4534
Big Creek	645	Livingston	2069	Thompson	21330
Blue Ridge	899	Kubela	1079	Thompson North	1240
Boling	1695	Labelle	70	Tomball	10146
Brenham	27	League City	1786	Turtle Bay	1381
Brookshire	3	Lovell's Lake	1163	Turtle Bay (LotzSand)	96
Buckeye	182	Lochridge	2405	Webster	9504
Buttermilk Slough	25	Lost Lake	120	West Columbia	2115
Caplen	300	Louise	1926	[fol. 640]	
Cedar Point	1037	Magnet	1519		
China (South)	100	Manvel Miocene	4713	Dickinson	5047
Chriesman	20	Manvel Oligocene	4793	Esperson Dome	1275
Clam Lake	198	Markham	2370	Esperson Dome So.	1000
Clay Creek	662	Markham North	88	Fannett	453
Clear Lake	727	Martha	200	Eureka Heights	3928
Cleveland	388	Old Ocean	10412	Eureka Heights Deep	30
Clinton	345	Orchard	350	Mykawa	146
Cotton Lake	472	Orange	558	Mykawa New	1033
Cotton Lake So.	1833	Orange West	2890	Nome	1393
Conroe	37373	Palacios	61	North Dayton	85
Damon Mound	303	Pickett Ridge	1418	West Columbia New	4851
Danbury Dome	640	Pierce Junction	3648	West Columbia Vicks	25
Fairbanks	10401	Port Neches	940	Withers	5699
Garwood	23	Port Neches West	410	Willow Slough	470
Gillock	6411	Raccoon Bend	1598	Wilson Creek	100
Goose Creek	1964	Roselyn	40		
Greens Lake	46	Raccoon Bend (Cockfield)	2389		
Hamman	2785	Saratoga	1242		
Hankamer Old	1104				

It is Further Ordered That allowable oil in the foregoing Order is measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9), and corrected to sixty (60) degrees Fahrenheit.

It Is Further Ordered That this Cause be held open on the Docket for such further orders as may be necessary and supported by evidence of record in the above Cause.

Railroad Commission of Texas, Lon A. Smith, Chairman; Jerry Sadler, Commissioner. (Seal.)

Attest: C. F. Petet, Secretary.

I, C. F. Petet, Secretary of the Railroad Commission of Texas, do hereby certify that the attached instrument, being a mimeographed copy of the Commission's Order entitled "Special Order Fixing Allowable Production of Crude Oil in the Various Fields and Districts in Texas" dated September 29, 1939, is a true and correct copy of the original now on file in these offices and in my custody as Secretary of said Commission.

[fol. 641] Witness My Hand and the Seal of the Railroad Commission of Texas this the 11th day of October, 1939.

(Signed) C. F. Petet, Secretary of the Railroad Commission of Texas. (Seal.)

[fol. 642] PLAINTIFFS' EXHIBIT No. 10

Railroad Commission of Texas, Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 and 146

#20-1237

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, January 24, 1940.

Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas

Whereas, After due Notice, hearings have been held in Austin, Texas, at various times, including the hearing on January 18, 1940, with respect to the existence and imminence of waste of oil and gas in the State of Texas, and the prevention thereof; and

Whereas, In view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and

Whereas, The Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning 7 a. m., February 1, 1940, until 7 a. m., March 1, 1940, and

Whereas, The Railroad Commission of Texas finds that waste exists and is imminent and that to prevent such waste of oil and gas as the same is defined by the applicable Statutes, it is necessary to restrict the production of oil in [fol. 643] the State of Texas to the reasonable market demand:

Therefore It is Ordered That beginning at 7 a. m., February 1, 1940, and until 7 a. m., March 1, 1940, the production of oil in the State of Texas and the various fields shown, shall be as hereinafter shown Except as provided for in the Commission's Order of January 24, 1940, entitled, "Special Order Shutting Down the East Texas Field Covering Rusk, Smith, Gregg, Cherokee and Upshur Counties, Texas."

Rule 2 of Division 2, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than Seventy Eight Thousand Four Hundred Fifty One (78,451) barrels of crude oil shall be produced from said District during any day of the effective period of this Order. Moore County shall not produce in excess of One Thousand (1,000) barrels of oil daily. Moore County allowable is in addition to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of Five Hundred Eighty (580) barrels daily. The Osborne Area allowable is in addition to the Panhandle allowable.

Rule 23 of Division 3, as contained in an Order of the Commission dated October 17, 1933, pertaining to the East Texas Field as amended by an Order of the Commission dated September 11, 1939, is hereby readopted and amended as follows:

Whereas, The Commission finds that in order to prevent waste in said field that the allowable production during the month of February, 1940, should not average more than 410,000 barrels per day over the thirty (30) day period, and that no more than 690,000 barrels of crude oil should be produced from the East Texas Field in any one day during the month of February, 1940, and

[fol. 644] Whereas, The Commission finds that there exists a market demand for crude oil produced in such an amount in the East Texas Field during the month of February, 1940.

It is therefore Ordered That Rule 23, of Division 3, of the

Commission's Order of October 17, 1933, pertaining to the East Texas Field be and it is hereby amended to read, effective February 1, 1940, as follows:

"Rule 23. (a) Not more than 690,000 barrels of crude oil shall be produced from the East Texas Field during any day of the effective period of this Order.

(b) The total daily allowable for the field shall be distributed among the producing wells in the field on the following basis:

1. Each well capable of producing twenty (20) barrels of crude oil per day shall be allowed to produce twenty (20) barrels per day.

2. Each well incapable of producing twenty (20) barrels per day shall be allowed to produce that amount of oil which it is capable of producing in a 24-hour period, not in excess of twenty (20) barrels.

3. In addition to the twenty (20) barrels provided for in one (1) above, each well in the field which is capable of producing in excess of twenty (20) barrels daily shall be allowed to produce daily that proportion of the total daily allowable for the field remaining after deductions for one (1) and two (2) above have been made, that the product of such well's hourly potential by its bottomhole pressure by the thickness of the saturated Woodbine Sand underlying the well by the average number of acres per well in the lease bears to the sum of such products for all of the wells in the field."

[fol. 645] 3. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the North Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Twenty Four Thousand Two Hundred Thirty Five (124,235) barrels of crude oil shall be produced from said District during any day of the effective period of this Order.

4. Rule 2 of Division 6, as contained in an Order of the Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Six Thousand One Hundred Sixty One (56,161) barrels of crude oil shall be produced

from said District during any day of the effective period of this Order, which is distributed in the following manner:

District No. 7-B

Brown County	1825	Jones County	5412	Ivy Field	1772
Callahan	1258	Akard Field	75	Stephens Co.	4281
Scranton	102	Appling Field	186	Loving Field	45
Coleman County	1270	Avoca Field	1478	Stribling Field	142
Novice Field	192	Griffin Field	1671	Stonewall Co.	
Comanche County	120	Hawley Field	504	Boyd Field	50
Amity Field	523	Palo Pinto Co.	500	Carlile Field	100
Eastland County	2654	Nolan County		Taylor County	134
Erath County	70	Hose Field	40	Bowles	220
Fisher County	2965	Schakleford Co.	5715	Throckmorton Co.	408
Haskell County	93				

District No. 7-C

Beddo	68	Hurdle	106	Page	60
Big Lake	6320	Irion	28	Simpson	21
Bolt	15	McCamey	13861	Webb Ray	37
Crockett	400	McMillan	77	World	1107
Grayson	151	Opp	41	Wyatt	20
Harrington	44				

Rule 4 of Division 7, as contained in an Order of the Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

[fol. 646] Rule 4. Not more than One Hundred Ninety Six Thousand Six Hundred Fifty Six (196,656) barrels of crude oil per day shall be produced from said district during any day of the effective period of this Order, which shall be distributed to the various fields therein as follows:

Anthony	28	Harper	3822	Richards	5
Apco	120	Henderson	2740	Sand Hills (Permian)	1537
Carter	40	Howard-Glasscock	16474	Sand Hills (Ordovician)	232
Cedar Lake	96	Iatan E-Howard	6248	Scarborough	2072
Church Fields	4800	Johnson	168	Seminole	765
Cowden, North	9680	Jordan	2627	Shearer	760
Cowden, N. Deep	83	Kermit	10710	Shipley	1717
Cowden, South	367	Keystone (Colby)	2350	Slaughter	1613
Cowden, Crane	1631	Keystone (Lime)	1624	Snyder	2275
Dune	409	Leck	703	Taylor-Link	2143
Dean	116	Lehn	280	Tobarg	1947
Deep Rock	189	Magnolia Sealy	528	Waddell	1100
Dobbs	9	Mason	290	Ward, North	6182
Duggan	474	Masterson	224	Ward, South	5185
Edwards	10	Means	2450	Wasson	18720
Emma	625	McClintic	1018	West	37
Emperor	1684	Monroe	24	Westbrook	951
Estes	6134	Moore	80	Wheat	999
Eaves	238	Netterville	223	White-Baker	206
Foster	9625	Northwest	613	Yates	18576
Fromme	87	Parker	33	Yates (Smith Sand)	150
Fuhrman	1314	Payton	2700	Waples-Platter	50
Graza	15	Pecos Valley (High Gravity)	989		
Goldsmith	18715	Pecos Valley (Low Gravity)	404		
Gulf-McElroy	2250	Penwell	3375		
Halley	310				
Hendrick	9688				

6. Rule 2 of Division 4, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Eighty Thousand and Fifteen (80,015) barrels of crude oil per day shall be produced from said District during any day of the effective period of this Order. Said amounts shall be allocated to the various fields in the following amounts:

[fol. 647]

District No. 5

Barette	108	Mexia	1721	Rowe & Baker	44
Bolivar	32	Negro Creek	3	South Bosque	21
Buffalo	50	Opelika	22	Sulphur Bluff	2540
Collinsville	39	Pottsboro	5	Van	13750
Corsicana Shallow	415	Powell	1954	Van Shallow	125
Currie	112	Rice	3	Wortham	98
Flag Lake	359	Richland	17	Wortham Shallow	7
Lott	17				

District No. 6

Boggy Creek	400	Marion Shallow	187	Redland	8
Cayuga	7750	Navarro Crossing	689	Rodessa	24671
Cayuga Trinity	18	Nacogdoches	14	Rodessa Hill	212
Ginter	37	Panola Co.		Shelbyville	20
Grapeland	100	(Bethany)	29	Talco	21627
Huntington	6	Percilla	15	Trinity	390
Lone Star	55	Potter	144	Waskom	96
Long Lake	2105				

7. Rule 2 of Section "A" of Division 8, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Two Hundred Twenty Three Thousand and Four Hundred (223,400) barrels of crude oil shall be produced in said district during any day of the effective period of this order and same shall be distributed as follows:

Division I

Alta Vista	12	Clark	149	Jacobs	613
Bateman	122	Darst Creek	6705	Kimbro	16
Black Hills	6	Dale	281	Larremore	63
Bob Rose	4	Dunlap	75	La Vernia	15
Burdette Wells	4	Dale West	103	Loma Alto	51
Buchanan	195	Dunlay	1	Luling Branyon	6257
Calliham	275	Eckert	115	Lytton Springs	481
Carroll	25	Ellison Young	107	Matthews	35
Cedar Creek	50	Espada Mission	1	Munson	114
Cedar Creek No.	30	Fairfield	6	Minerva Rockdale	212
Carver-Kallison	10	Ezzell	1433	Noack	118
Chapman Abbott	267	Gas Ridge	11	Pearsall	421
Chicon Lake	49	Hilbig	244	Philtop	19

Division I (Continued)

Red Rock	40	Spiller	19	Deupree	3
Riddle	31	Taylor Ina	26	Manford	20
Salt Flat	4901	Thrall	56	Walnut Creek	18
Salt Flat No.	75	Von Ormy	197	Yoast	37
Somerset	591			Zoboroski	83
Southton	79	[fol. 648]			

Division II

Burnell, South	645	La Rosa	3300	Placado, East	385
Cordeil	2520	Mayritz	174	Plummer	274
Caesar	230	McFaddin	1880	Ray	220
Coleto Creek	380	McMurray	8	Sarco	3
Diamond Half	234	McNeil	66	Slick	12
Dinero	23	Mellon Creek	303	New Refugio	3630
Dirks	1827	Mt. Lucas	53	Refugio Fox	472
Francitas	292	Mission River	528	Old Refugio	1110
Ganado	58	Normanna	51	Tom O'Connor	19488
Greta Deep	225	O'Connor McFaddin	80	Telfner, East	10
Greta	4000	Oakville	470	Tuleta	230
Heyser	7784	Pettus	577	Tulsita	18
Holzmark	47	Pettus, New	852	Voss	15
Hordes Creek	25	Placado	5210	White Creek	140
Keeran	692			West Ranch	1862

Division IV

Adami	262	East Bruni	195	O'Hern	4387
Agua Dulce	112	El Tanque	132	Oilton	1049
Albercas	60	Escobas	1035	Piedre Lumbre	1301
Alfred	180	Fitzsimmons	2722	Plymouth	7128
Alta Verde	6	Flour Bluff	4160	Peters	51
Angelita	6	Govt. Wells No.	7715	Peters, East	20
Alice	1840	Govt. Wells S.	3698	Piedras Pintas	12
Alta Mesa	440	Guerra	280	Premont	354
Aviators	453	Henne-Winch-Farris	5	Premont East	435
Aransas	9280	Holland-Hebbronville	26	Rancho Solo	282
Baldwin	283	Jennings	961	Rancho Solo Ext.	225
Barbacoas	7	Kingsville	47	Randado	247
Benavides	6130	Kohler	47	Reynolds	1232
Ben Bolt	960	Kohler Deep	19	Sweden	62
Bird Island	46	Hoffman	3470	Sun	543
Blanchard	58	Killam	409	[fol. 649]	
Bruni	316	Killam North	129	Richard King	987
Camada	11	Kelsey	1698	Rinson	70
Captain Lucey	109	Labbe	165	Riverside	102
Caroline-Texas	8	Laurel	10	Robstown	51
Casa Blanco	309	La Gloria	51	Sandia	11
N. Casa Blanca	90	Las Animas	29	Sam Fordyce N.	151
Cedro Hill	220	Sarnosa	367	Sam Fordyce	1813
Charco Redondo	17	Loma Novia	11483	Sexet	8730
Charamousca	423	Loma Vista	4	Sexet Frio	7103
Chiltipin	79	London	41	Seven Sisters	5120
Clark-Muil	80	Longhorn	1400	Seven Sisters S.	615
Cole West	394	Los Olmos	69	Sinton	6
Colorado	630	Lopez	3922	Southland	101
Colmena	207	Luby	5350	Sullivan	90
Rio Grande City	71	Luby North	69	Sullivan City	77
Roma	6	Lundell	606	Taft	1950
Ricaby	128	Magnolia City	101	Tarancahuas	13
Clara Driscoll	1470	Mathis, East	29	Tom Graham	1230
Clara Driscoll S.	1000	Midway	550	Tesoro	169
Conoco Driscoll	1143	Minnie Bock	803	Turkey Creek	2770
Comitas	611	Mirando City	455	Volpe	203
Corpus Christi	965	Mirando Valley	618	White Point	71
Cuellar	67	Moca	135	E. White Point	7400
Driscoll Ranch	37			Zim	3
Eagle Hill	508				

8. Rule 2 of Section A, Division 9, as contained in an Order of the Railroad Commission dated October 17, 1933, pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than Two Hundred Twenty-Five Thousand Three Hundred Seventy-two (225,372) barrels of crude oil shall be produced from said district during any day of the effective period of this Order, which shall be distributed as follows:

Aldine Area	58	Hull, New	3861	Turtle Bay (Lotz Sand)	10
Allen Dome	5	Hull, Old	2180		
Amelia	3314	Humble	3283	[fol. 650]	
Anahuac	6190	Joes Lake	1210		
Armour	180	Kubela	525	Clinton	165
Arriola	245	LaBelle	70	Conroe	21200
Bammel	100	League City	2100	Cotton Lake	308
Barbers Hill	9282	Livingston	1984	Cotton Lake, S.	1403
Batson (New)	922	Lochridge	2592	Damon Mound	359
Batson (Old)	491	Lost Lake	120	Danbury Dome	316
Bay City	3710	Louise	1125	Dickinson	4935
Beaumont, West	2664	Lovells Lake	1990	Esperson Dome	1275
Big Creek	375	Magnet	1378	Esperson Dome S.	560
Blue Ridge	661	Manvel Miocene	2365	Eureka Heights	2009
Boling	1536	Manvel Oligocene	4055	Eureka Heights (D)	32
Brenham	40	Pickett Ridge	1174	Fairbanks	7770
Brookshire	3	Pierce Junction	2508	Fannett	306
Buckeye	142	Port Neches	496	Markham	1178
Buttermilk Slough	25	Port Neches, W.	257	Markham, North	106
Caplen	232	Raccoon Bend	1598	Martha	232
Cedar Bayou	49	Raccoon Bend (Cockfield)	2940	Mykawa	136
Cedar Point	550	Roselyn	30	Mykawa, New	1033
China, South	116	Sandy Point	64	Nome	833
Chriesman	30	Saratoga	1289	North Dayton	85
Clam Lake	154	Satsuma	459	North Houston	232
Clay Creek	384	Schwab	58	Old Ocean	11260
Clear Lake	822	Schwab-Wilcox	300	Orange	395
Cleveland	225	Seabreeze	165	Orange, West	2046
Garwood	23	Segno	1182	Orchard	206
Green-s Lake	46	Segno, Deep	1800	Palacios	61
Gillock	6464	Silsbee	1245	Webster	8730
Goose Creek	2054	Sour Lake	1738	West Columbia	1772
Hamman, Shallow	466	South Houston	2180	West Columbia (Vicksburg)	25
Hamman, Deep	2615	South Liberty	575	West Columbia (New)	3542
Hankamer	692	Spindletop	1992	Willow Slough	273
Hankamer, New	210	Sugarland	4930	Wilson Creek	58
Hardin	5190	Thompson, North	1365	Withers & Five Corners	5800
Hastings	17250	Thompson	11907		
High Island	2453	Tomball	6080		
Hillje	33	Turtle Bay	890		
Hitchcock	690				

It Is Further Ordered That allowable oil in the foregoing Order is measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9), and corrected to Sixty (60) degrees Fahrenheit.

It Is Further Ordered That this Cause be held open on

the Docket for such further orders as may be necessary and supported by evidence of record.

Railroad Commission of Texas, Lon A. Smith, Chairman; Ernest O. Thompson, Jerry Sadler, Commissioners. (Seal.)

Attest: C. F. Petet, Secretary.

STATE OF TEXAS,
County of Travis:

I, C. F. Petet, Secretary of the Railroad Commission of the State of Texas, do hereby certify that the attached order, described as follows:

Order of the Railroad Commission of Texas dated January 24th, 1940, entitled "Special Order Affecting the Allowable Production of Crude Oil in the Various Fields and Districts in Texas"

[fol. 651] is a true and correct copy of the original order now on file in the Railroad Commission, and in my custody as Secretary and Custodian of the files of the Railroad Commission.

Witness my hand and seal of the Railroad Commission of Texas, this the 31st day of January, 1940.

(Signed) C. F. Petet, Secretary. (Seal.)

Endorsed: No. 31 Civil. Filed 13th day of February, 1940. Maxey Hart, Clerk. (Signed) By Maxey Hart. Pltffs. Ex. 10.

[fol. 652] PLAINTIFFS' EXHIBIT No. 12

Railroad Commission of Texas, Oil and Gas Division

Oil and Gas Docket No. 120

#6-1248

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the East Texas Field

Austin, Texas,
January 24, 1940.

Special Order Shutting Down the East Texas Field Covering Rusk, Smith, Gregg, Cherokee and Upshur Counties, Texas

Whereas, After due Notice hearings have been held in

January 18, 1940, with respect to the existence and imminence of waste of oil and gas in the State of Texas and the prevention thereof, and

Whereas, On January 24, 1940, the Commission issued a "Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas," and

Whereas, Under said Order of the Commission the maximum quantity of oil which is permitted to be produced from the East Texas Field was set at 690,000 barrels per day, and

Whereas, The Commission finds that in order to maintain the bottom-hole pressure in the East Texas Field and in order to prevent waste, it is necessary that all wells in the East Texas Field be closed in for a total of twelve (12) days during the month of February, 1940:

Therefore It Is Ordered That each and every well in the East Texas Field shall be shut in on the following days: February 3, 4, 7, 10, 11, 14, 17, 18, 21, 24, 25 and 28, 1940. [fol. 653] It Is Further Ordered That no exceptions to this Order will be granted except when justified by evidence presented to the Commission to the effect that, because of reservoir conditions, continuous production should be maintained to prevent physical waste, in which case, the total allowable of the well or wells so excepted shall be reduced during the period covered by this Order an amount equivalent to twelve (12) days' allowable during the month of February, 1940.

It Is Further Ordered That the natural gasoline extraction plants be and are hereby given authority to advise the operators of the oil wells connected to their gathering systems that it will be agreeable for those operators of oil wells to produce their allowable oil on each of the days covered by this shut-down order with the understanding, however, that operators of oil wells so producing restrict the production a total of twelve (12) days during the month of February, 1940.

It Is Further Ordered That this Order shall not apply to those wells in the East Texas Field which the Commission has found to be marginal wells and shown to be such on the Commission's current proration schedule now in force and effect in the East Texas Field.

It Is Further Ordered That this Cause be held open on

the Docket for such other and further orders as may be necessary and supported by evidence of record.

Railroad Commission of Texas, Lon A. Smith, Chairman; Ernest O. Thompson, Jerry Sadler, Commissioners. (Seal.)

Attest: C. F. Petet, Secretary.

[fol. 654] STATE OF TEXAS,
County of Travis:

I, C. F. Petet, Secretary of the Railroad Commission of the State of Texas, do hereby certify that the attached order, described as follows:

Order of the Railroad Commission of Texas dated January 24th, 1940, entitled "Special Order Shutting Down The East Texas Field Covering Rusk, Smith, Gregg, Cherokee, and Upshur Counties, Texas"

is a true and correct copy of the original order now on file in the Railroad Commission, and in my custody as Secretary and Custodian of the files of the Railroad Commission.

Witness my hand and seal of the Railroad Commission of Texas, this the 31st day of January, 1940.

(Signed) C. F. Petet, Secretary. (Seal.)

Endorsed: No. 31 Civil. Filed 13th day of February, 1940. Maxey Hart, Clerk. (Signed) Maxey Hart. Pltffs. Ex. 12.

[fol. 655] PLAINTIFFS' EXHIBIT No. 13

Railroad Commission of Texas

Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 and 146

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

20-1238

Austin, Texas, January 24, 1940.

Order Amending Paragraph 3, "Marginal Well Exemption," Immediately Preceding Division (1) of Oil and Gas Circular No. 16-B

Pursuant To notice and hearing and based on the finding

ion of the Attorney General of the State of Texas defining marginal wells as that term is used in Article 6049b of the Civil Statutes of the State of Texas, as well as the power of the Railroad Commission of Texas, to regulate the production from marginal wells, the Commission Order of May 15, 1934, issued as Oil and Gas Circular No. 16-B is hereby amended in the following particulars to-wit:

Paragraph 3, Marginal Well Exemption immediately preceding Division (1) of Oil and Gas Circular No. 16-B is hereby amended, effective February 1, 1940, to read as follows:

"3. *Defining Marginal Wells and Fixing the Amount of Oil that May be Produced Therefrom.*—

"Section A. Each pumping oil well within this State having a daily capacity for production of only ten (10) barrels or less averaged over the preceding 30 consecutive day period and producing from a depth of 2,000 feet or less shall be allowed to produce any amount of oil up to and including ten (10) barrels of oil per day.

"Section B. Any pumping oil well within this State hav- [fol. 656] ing a daily capacity for production of only twenty (20) barrels or less averaged over the preceding 30 consecutive day period and producing from a horizon deeper than 2,000 feet and less than 4,000 feet shall be allowed to produce any amount of oil up to and including 20 barrels of oil per day.

"Section C. Any pumping oil well within this State having a daily capacity for production of only twenty-five (25) barrels or less averaged over the preceding 30 consecutive day period and producing from a horizon deeper than 4,000 feet and less than 6,000 feet shall be allowed to produce any amount of oil up to and including 25 barrels of oil per day.

"Section D. Any pumping oil well within this State having a daily capacity for production of only thirty (30) barrels or less averaged over the preceding 30 consecutive day period, and producing from a horizon deeper than 6,000 feet and less than 8,000 feet shall be allowed to produce any amount of oil up to and including 30 barrels of oil per day.

"Section E. Any pumping oil well within this State having a daily capacity for production of only thirty-five (35) barrels or less averaged over the preceding 30 consecutive

No. 31 Civil
Filed 14 th day of Feb
19 40 at o'clock M.
MAXEY HART, Clerk.
By G. E. Davis
Deputy.

14

PLAINTIFFS EXHIBIT No. 14

EAST TEXAS FIELD: TABLE I.

COMPARISON OF THE DAILY ALLOWABLE PER 100 ACRE-FEET OF OIL SAND BETWEEN HUMBLE COMPANY LEASES FAVORABLY SITUATED IN VARIOUS PARTS OF THE FIELD AND OTHER LEASES FAVORABLY AND LESS FAVORABLY SITUATED IN THE GENERAL VICINITY AS OF FEBRUARY 1, 1940

Example	Company	Lease	Survey	No. Wells	Prod. Acres	Sand Thickness	Acre-Feet	Daily Allowable	Allowable per Day per 100 Acre-Feet of Sand	Ratio Over Humble
I. LONGVIEW DISTRICT:										
	Humble	**KILLINGSWORTH, MATTIE**	**Hathaway & Ferguson**	**20**	**99.70**	**102.0**	**10,170.0**	**660.12**	**6.50**	
	Yeager & Schubert	Finley-Thomas	Alexander, C.	8	11.88	47.0	558.0	182.33	32.70	5.8
	Simmons & Alexander	Jackson, Red Bird-Blk.26	Dillard, M.	3	1.55	30.0	46.5	72.12	155.10	18.2
	Carr, A. P.	Ritchie, G. W.	Carleton	15	15.63	71.9	1,124.3	347.95	30.95	3.6
	Skipper Oil Co.	Snoddy, Thad	Castleberry	4	4.00	37.5	150.0	85.90	57.27	6.7
II. KILGORE DISTRICT:										
	Humble	**LAIRD, S. S. "A"**	**Ruddle, I.**	**43**	**250.00**	**74.3**	**17,083.0**	**1,406.23**	**8.23**	
	Henry Oil Co.	Laird, S. S. & Ben	Van Winkle, Mary	12	7.97	42.5	338.7	245.89	72.60	8.8
	Rancho Oil Co.	Bean, Crim Blk. 4	Van Winkle, Mary	7	2.00	42.0	84.0	141.19	168.10	20.4
	Patterson Drlg. Co.	Brock, M.	Winn, R.	6	9.00	50.7	456.0	139.78	30.65	3.7
	Moss, H. S.	Marshall	Van Winkle, Mary	16	38.93	10.0	389.3	317.98	81.68	9.9
III. HENDERSON:										
	Humble	**WOOLEY, T. M.**	**Cordova**	**9**	**55.50**	**58.1**	**3,196.0**	**309.70**	**9.69**	
	Fisher, F. W.	Eaton "B"	Cordova	23	21.13	70.0	1,479.1	510.60	34.52	3.6
	Miller Prod. Corp.	Bradford, D. "B"	Ximines	8	16.00	15.5	248.0	162.20	65.40	6.8
	Texas Trading Co.	Deason	Pru	5	6.00	43.0	258.0	103.95	40.29	4.2
	Texas-Jersey	Keeling "B"	Cordova	5	0.58	75.0	43.5	101.65	233.68	24.1
	Lemaster	Wright	Vargas	5	3.00	44.0	132.0	104.15	78.90	8.1
	Lowbree & Su-Ni	Cook, S. S.	Vargas	8	10.00	11.0	110.0	162.33	147.57	15.2

PLAINTIFFS EXHIBIT No. 15

15
No. 240-31 Civil
Filed 14th day of Feb.
1940 at ... o'clock ... M.
MAXEY HART, Clerk.
By J. E. Davis
Deputy.

EAST TEXAS FIELD: TABLE II.

COMPARISON OF THE RELATIVE DAILY ALLOWABLE PER 100 ACRE-FEET OF OIL SAND BETWEEN HUMBLE OIL & REFINING COMPANY PROPERTIES AND OFFSETTING LEASES AS OF FEBRUARY 1, 1940

Company	Lease	Survey	Prod. Acres	No. Wells	Density	Avg. Sand Thickness	Acre-Feet of Oil Sand	Avg. Potential	Avg. Pressure	Lease Allowable	Allowable per Day per 100 Ac./Ft. of Sand	Ratio Over Humble
LONGVIEW DISTRICT:												
Humble	BOWLES, J. F.	Ferguson, D.	100.50	19	5.29	79.9	8,030.0	908.9	1139.2	732.17	9.12	
Offset Leases												
Tillery, J. L.	Wheeler, Wm. Heirs	Ferguson	2.66	1	2.66	81.0	215.5	885.0	1135.0	29.15	13.53	1.5
Rudco O.&G. Co.	Fenn, M. J.	"	3.70	2	1.85	81.5	301.6	930.0	1140.0	53.54	17.75	1.9
Rancho Oil Co.	Fenn, M. J..	"	7.50	3	2.50	84.0	630.0	929.3	1135.0	87.97	13.96	1.5
Humble	HUGHES, A. L.	Hampton & Wakeland	90.80	20	4.54	84.9	7,708.9	929.5	1133.5	744.41	9.66	
Offset Leases												
McLemore, M. C.	Gladewater School	Wakeland, W. C.	1.00	1	1.00	87.0	87.0	955.0	1130.0	25.98	27.56	2.9
Trapp & Blankenship	Fenn, M. J.	Hampton, G. C.	2.00	1	2.00	83.0	166.0	915.0	1140.0	27.34	16.47	1.7
Atlantic O.P. Co.	HollySprings Ch.	Ferguson, D.	2.00	1	2.00	86.0	172.0	930.0	1130.0	27.66	16.08	1.7
Rancho Oil Co.	Fenn, M. J. "B"	"	11.00	4	2.75	83.5	918.5	927.5	1137.5	121.03	13.18	1.4
Humble	JOHNSON, G. W.	Hooper, G. W.	98.90	26	3.80	64.9	6,418.6	839.6	1104.7	772.18	12.03	
Offset Leases												
Canadian P. Co.	Christian, Tom	Hooper, G. W.	.67	1	.67	68.0	45.6	900.0	1110.0	21.93	48.09	4.0
F.H.E. Oil Co.	Christian, J. M.	"	7.85	6	1.31	80.5	630.6	917.5	1105.0	147.12	23.33	1.9
Atlantic O.P. Co.	Johnson, G. W.	"	1.50	1	1.50	72.0	108.0	875.0	1110.0	24.44	22.63	1.9
Woodrow Pet. Corp.	Johnson, D. M.	"	1.50	1	1.50	72.0	108.0	875.0	1110.0	24.44	22.63	1.9
Margay Oil Co.	Christian, Tom	"	24.71	12	2.06	67.8	1,676.1	910.4	1100.0	310.52	18.53	1.5
Humble	JOHNSTON, D. "A"	Crosby, J. R.	88.13	13	6.78	39.2	3,454.7	851.9	1166.8	401.85	11.63	
Offset Leases												
Lee, T. W.	Lee Fee	Rigsby, L. J.	.50	1	.50	42.0	21.0	650.0	1170.0	20.68	98.48	8.5
Meco Prod. Co.	Hickman (Blk.71)	Dillard, M.	1.17	1	1.17	27.0	31.6	825.0	1175.0	21.30	67.41	5.8
Meco Prod. Co.	T&P RR (Blk.48)	"	1.28	1	1.28	28.0	35.8	805.0	1175.0	21.43	59.86	5.1
Lange Cable Tool	Beamer, J. C.	"	.98	1	.98	38.0	37.2	745.0	1170.0	21.38	57.47	4.9
Roosth & Genecov	Todd, S. D.	"	2.50	2	1.25	35.5	88.8	765.0	1170.0	42.68	48.06	4.1
Meco Prod. Co.	T&P RR (Blk.72)	"	2.42	1	2.42	27.0	65.3	832.0	1175.0	22.71	34.78	3.0
Roosth & Genecov	Johnson, D.	"	2.00	1	2.00	30.0	60.0	625.0	1175.0	22.02	36.70	3.2
Pitzer & West	Johnson, D. "B"	Rigsby, L. J.	11.54	4	2.88	40.3	465.1	757.5	1170.0	97.41	20.94	1.8

659

EAST TEXAS FIELD: TABLE II
Page 2

Company	Lease	Survey	Prod. Acres	No. Wells	Density	Avg. Sand Thickness	Acre-Feet of Oil Sand	Avg. Potential	Avg. Pressure	Lease Allowable	Allowable per Day per 100 Ac./Ft. of Sand	Ratio Over Humble
KILGORE DISTRICT:												
Humble	CRIM, L. D.	Sevier-Chism	915.43	188	4.87	65.8	60,235.3	856.6	1136.4	6,101.28	10.13	
Offset Leases												
Luling O.&G. Co.	Brightwell, W.J. "A"	Winn, R. E.	10.00	4	2.50	43.3	432.5	888.7	1145.0	98.64	22.81	2.3
Upchurch & Co.	Brightwell, W. J.	"	10.00	4	2.50	46.7	467.0	875.0	1140.0	99.75	21.31	2.1
Atlantic O.P. Co.	Brightwell, W.J. "B"	"	10.00	4	2.50	49.0	490.0	871.2	1140.0	100.63	20.54	2.0
Lyons, C. H.	Ladd, Dave	Hobson, H.	2.50	1	2.50	78.0	195.0	740.0	1110.0	26.79	13.74	1.4
Wooley Pet. Co.	Ladd, Dave	"	2.50	1	2.50	80.0	200.0	735.0	1105.0	26.88	13.44	1.3
Humble	KNOWLES, J. A.	Van Winkle, Mary	100.00	29	3.45	29.9	2,990.0	336.6	1004.4	625.77	20.93	
Offset Leases												
Harcher O. Co.	K. of P. Lodge	Van Winkle, Mary	.25	1	.25	14.0	3.5	200.0	985.0	20.03	572.29	27.3
McMurray, Jim	Col. Baptist Ch.	"	.56	2	.28	13.0	7.3	192.5	990.0	40.06	548.77	26.2
Murray, C. H.	Odd Fellows Lodge	"	.50	1	.50	14.0	7.0	200.0	990.0	20.06	286.57	13.7
Degener & Co.	Bell, S.	"	1.67	2	.84	11.0	18.4	155.0	985.0	40.12	216.04	10.4
Dodwell, L. E.	Alexander, L.	"	3.50	4	.87	10.8	37.6	168.7	985.0	80.28	213.51	10.2
Jenkins, J. J.	Alexander, C.	"	2.11	2	1.05	10.0	21.1	115.0	985.0	40.10	190.05	9.1
Potter Bros.	Kilgore Col. Ch.	"	1.44	2	.72	15.0	21.6	205.0	990.0	40.18	186.02	8.9
Murray, C. H.	Walton, Ida	"	1.00	1	1.00	14.0	14.0	200.0	990.0	20.12	143.71	6.9
Wells & Gann	Johnson, Gordie	"	4.70	5	[illegible]	14.8	69.6	199.0	996.0	100.59	144.53	6.9
Spear, A.	Ector, H.	"	1.00	2	.50	40.0	40.0	415.0	1040.0	40.74	101.85	4.9
Brown, W. A	Cheesborough, W	"	1.53	2	.76	14.0	21.4	202.5	990.0	40.18	97.05	4.6
Moss Oil & Gas Co.	Walton, Ida	"	4.67	3	1.56	14.3	66.9	203.3	990.0	60.60	90.58	4.3
Hastings et al	Robinson, W. M.	"	4.70	3	1.56	17.0	79.9	241.6	1015.0	60.82	76.12	3.6
Humble	THOMAS, DURA	Van Winkle, Mary	59.05	22	2.68	52.8	3,117.8	417.0	1022.0	496.29	15.92	
Offset Leases												
Trapp, M. E.	King, J. R.	Van Winkle, Mary	1.46	6	.24	48.2	69.4	273.3	1010.0	120.82	174.09	10.9
Atlantic O.P. Co.	Barton, P. E.	"	3.36	2	1.68	49.5	166.3	390.0	1025.0	42.88	25.78	1.6
Reynolds, Roy A.	Elder, Mrs. Z.	"	2.95	4	.74	52.0	153.4	287.5	1028.0	81.92	53.40	3.4
WrightSmith O. Co.	Harris, I. E.	"	1.48	2	.74	52.0	77.0	310.0	1015.0	41.02	53.27	3.4
Atlantic O.P. Co.	Elder, Tripp "A"	"	7.62	7	1.09	43.3	329.9	355.7	1022.9	145.06	43.97	2.8
Prod. Inv. Co.	Butts, J. A.	"	11.07	9	1.23	52.2	578.1	364.4	1020.0	189.13	32.72	2.1
Atlantic O.P. Co.	Elder, Tripp "B"	"	.86	1	.86	40.0	34.4	395.0	1020.0	20.59	59.85	3.8
Overton Refg. Co.	Butts, J. T.	"	.25	3	.08	50.0	12.5	261.7	1015.0	60.15	481.20	30.2
Gold Star Oil Co.	Butts, J. T.	"	.70	2	.35	50.0	35.0	330.0	1015.0	40.50	115.71	7.3
Potter Bros.	Butts, J. A.	"	.20	3	.07	50.0	10.0	303.3	1015.0	60.15	601.50	37.8
Ramill & Smith	Butts, J. T.	"	.22	2	.11	32.5	7.2	295.0	1015.0	40.14	557.50	35.0

660

EAST TEXAS FIELD: TABLE II.
Page 3.

Company	Lease	Survey	Prod. Acres	No. Wells	Density	Avg. Sand Thickness	Acre-Feet of Oil Sand	Avg. Potential	Avg. Pressure	Lease Allowable	Allowable per Day per 100 Ac./Ft. of Sand	Ratio Over Humble
HENDERSON DISTRICT:												
Humble	KEE, W. B.	Field-Womack	95.38	16	5.96	24.4	2,327.3	727.8	1172.8	406.19	17.45	
Offset Leases												
Archer, C. L.	Stewart, J. H.	Womack, J.	7.00	3	2.33	14.3	100.3	535.0	1180.0	62.68	62.49	3.6
Sklar	"	"	3.00	1	3.00	16.0	48.0	480.0	1175.0	21.15	44.06	2.5
Snyder	"	"	3.00	1	3.00	16.0	48.0	595.0	1175.0	21.42	44.63	2.6
Williams, I.M. Tr.	Goforth, T. H.	Lindley-Thompson	18.65	5	3.73	16.0	298.4	542.0	1176.0	108.01	36.20	2.1
Johnson, T.A. Tr.	Stewart, J. H.	Womack, J.	8.00	2	4.00	15.5	124.0	550.0	1175.0	43.40	35.00	2.0
Humble	PLOHMAN,S A. "A & B"	Cordova, F	242.96	52	4.67	63.0	15,306.5	788.9	1038.2	1,581.24	10.33	
Offset Leases												
F.H.E. Oil Co.	Thompson, M. L. "D"	Cordova, F.	15.00	5	3.00	48.2	723.0	622.0	1016.0	120.01	16.60	1.6
Powell, H. P.	Thompson, M. L.	Pru, M. J.	10.00	5	2.00	62.8	628.0	641.0	1019.0	117.36	18.69	1.8
F.H.E. Oil Co.	Thompson, M. L. "E"	Cordova, F.	1.00	1	1.00	51.0	51.0	675.0	1020.0	21.49	42.14	4.1
Magnolia Pet. Co.	Barksdale, C	Pru, M. J.	15.00	5	3.00	54.6	819.0	612.0	1010.0	121.47	14.85	1.4

661

No. 31 Plaintiff
Filed 14 day of Feb.
1940 at ... o'clock ... M.
MAXEY HART, Clerk.
By J. E. Davis Deputy.

FEB 13 1940

TEXAS

PLAINTIFFS EXHIBIT No. 16

EAST TEXAS FIELD: TABLE III.

DAILY ALLOWABLE PER 100 ACRE-FEET OF SAND FOR LEASES OF TWO ACRES OR LESS (EXCLUDING LEASES WITH MARGINAL WELLS) COMPARED WITH HUMBLE OIL & REFINING COMPANY PROPERTIES

Number Acres per Tract	No. of Tracts	Total Acres	Average Density	No. Wells	Avg. Sand Thickness	Total Acre-Feet of Oil Sand	Daily Lease Allowable 2/1-40	Allowable per Day per 100 Acre-Feet of Sand
.00 - .49	159	98.12	.22	448	45.1	4,421.6	9,022.81	204.1
.50 - .99	169	318.50	.73	436	42.1	13,394.1	9,109.93	68.0
1.00 - 1.49	236	751.45	1.19	631	42.5	31,937.3	13,739.49	43.0
1.50 - 2.00	271	1,466.46	1.77	829	43.0	63,073.9	18,653.68	29.6
Total	835	2,634.53	1.12	2,344	42.8	112,826.9*	50,525.91	44.8
Total Humble Properties		14,656.03	5.75	2,547	48.3	707,770*	77,195.59	10.9
Field - Excluding Humble Properties		116,674.97	4.98	23,423	36.5	4,253,776	614,105.41	14.4
Total Field		131,331.00***	5.06	25,970	37.8	4,961,546**	691,301.00	13.9

* Taken from Railroad Commission Data.
** Obtained by Planimeter Measurement of Railroad Commission Isopach Map. Area Between 0-10' Contours Assigned 10' Average Sand.
*** Estimated by Railroad Commission Office.

PLAINTIFFS EXHIBIT No. 17

FILED
FEB 13 1940
AUSTIN, TEXAS
No. 17
No. 57 Equity
Filed 14th day of Feb.
1940 at o'clock M.
MAXEY HART, Clerk.
By J. E. Davis

EAST TEXAS FIELD: TABLE IV-A.

LONGVIEW DISTRICT

A COMPARISON OF THE RELATIVE DAILY ALLOWABLE OF WELLS WITH VARYING SAND THICKNESS SHOWING HOW THE ALLOWABLE PER 100 ACRE-FEET OF SAND DECREASES AS THE AVERAGE SAND THICKNESS INCREASES

Company	Well Name	From Railroad Commission Allowable Schedule.- February 1, 1940 Density	Sand Thickness	Pressure	Potential	Acre-Feet	Allowable	Allowable per Day per 100 Acre-Feet of Sand
Grace Oil Co.	# 3 Starker	5.35	10'	1185	195	53.5	20.53	38.37
Iowa Payne Oil Co.	# 5 York	5.16	20'	1180	385	103.2	21.99	21.31
Texas Co.	# 4 Johnson	4.87	30'	1170	835	146.1	26.04	17.82
Cox & Hamon	# 1 Rodden	5.86	40'	1165	825	234.4	30.11	12.85
Humble O. & R. Co.	# 4 McFarland	5.39	49'	1165	840	264.1	30.93	11.71
Cities Service	# 3 Jeter, L. A.	4.89	60'	1158	820	293.4	31.80	10.84
Cities Service	#13 Jeter, L. A.	4.89	70'	1155	815	342.3	33.65	9.83
Cities Service	#10 Rogers	5.42	80'	1140	900	433.6	38.84	8.96
Sun	# 2 Akin, J. W.	5.45	90'	1125	965	490.5	42.60	8.69
Sun	#16 Akin, J. W.	5.45	100'	1125	970	545.0	45.24	8.30
Sinclair-Prairie	# 9 Akin, J. W. "A"	5.68	90'	1110	975	511.2	43.43	8.50
Amerada	# 7 Bumpas, C.	5.78	80'	1100	950	462.4	40.46	8.75
Sun	# 2 Satterwhite	4.99	70'	1090	940	349.3	35.16	10.07
Arkansas	# 5 Orms, L. E.	5.00	60'	1090	920	300.0	32.74	10.91
Lucey Pet.	# 7 Fisher	5.42	50'	1085	890	271.0	31.08	11.47
Humble O. & R. Co.	#13 Harris, T. B. & T. D.	5.47	40'	1075	890	218.8	26.87	12.28
Humble O. & R. Co.	#20 Harris, T. B. & T. D.	5.47	30'	1065	550	164.1	24.07	14.67
Monday	# 1 Harris, T. B. "B"	4.43	20'	1060	400	88.6	21.59	24.37
Monday	# 5 Harris, T. B. "B"	4.43	10'	1055	200	44.3	20.39	46.03

PLAINTIFFS EXHIBIT No. 18

EXHIBIT
FEB 13 2010
PLAINTIFF'S EXHIBIT 18
TEXAS

EAST TEXAS FIELD: TABLE IV-B.

LONGVIEW DISTRICT

SUPPLEMENT TO TABLE IV-A: ASSUMING A DENSITY OF FIVE ACRES FOR EACH WELL IN COMPUTING DAILY ALLOWABLE

No. 51 Civil
Filed 14 day of June
In Vol. ... Page ...
MAXEY HART, Clerk
By O. E. Deane Deputy

Company	Well Name	Density	From Railroad Commission Allowable Schedule - 2/1-40 Sand Thickness	Pressure	Potential	Acre-Feet	Allowable	Allowable per Day per 100 Acre-Feet of Sand
Grace Oil Co.	# 3 Starker	5.00	10'	1185	195	50.0	20.49	40.98
Iowa Payne Oil Co.	# 5 York	5.00	20'	1180	385	100.0	21.92	21.92
Texas Co.	# 4 Johnson	5.00	30'	1170	835	150.0	26.20	17.47
Cox & Hamon	# 1 Rodden	5.00	40'	1165	825	200.0	28.14	14.07
Humble O. & R. Co.	# 4 McFarland	5.00	49'	1165	840	245.0	30.16	12.31
Cities Service	# 3 Jeter, L. A.	5.00	60'	1158	820	300.0	32.07	10.69
Cities Service	#13 Jeter, L. A.	5.00	70'	1155	815	350.0	33.95	9.70
Cities Service	#10 Rogers	5.00	80'	1140	900	400.0	37.38	9.35
Sun	# 2 Akin, J. W.	5.00	90'	1125	965	450.0	40.69	9.04
Sun	#16 Akin, J. W.	5.00	100'	1125	970	500.0	43.11	8.62
Sinclair-Prairie	# 9 Akin, J. W. "A"	5.00	90'	1110	975	450.0	40.65	9.03
Amerada	# 7 Bumpas, C.	5.00	80'	1100	950	400.0	37.70	9.42
Sun	# 2 Satterwhite	5.00	70'	1090	940	350.0	35.19	10.05
Arkansas	# 5 Orms, L. E.	5.00	60'	1090	920	300.0	32.74	10.91
Lucey Pet.	# 7 Fisher	5.00	50'	1085	890	250.0	32.27	12.91
Humble O. & R. Co.	#13 Harris, T. B. & T. D.	5.00	40'	1075	690	200.0	26.28	13.14
Humble O. & R. Co.	#20 Harris, T. B. & T. D.	5.00	30'	1065	550	150.0	23.72	15.81
Monday	# 1 Harris, T. B. "B"	5.00	20'	1060	400	100.0	21.80	21.80
Monday	# 5 Harris, T. B. "B"	5.00	10'	1055	200	50.0	20.45	40.90

PLAINTIFFS' EXHIBIT NO. 26.

Comparison of Acre Feet of Sand, Well Density, Allowable and Allowable Per 100 Acre Feet Per Day for Rowan & Nichols and Various Leases in Castleberry and Robertson Surveys Located East of Todd A Lease

Co. & Lease	Acres	Sand Thickness	Ac. Ft. Sand	Allowable	Density	Bbls. per 100 ac.ft.
Rowan & Nichols Todd A	28.25	93.0	2627.	260.56	4.03	10.11
Skipper-Sivins	4.0	38.0	190.	85.90	1.0	45.21
Fields-Blackstone	5.0	72.0	360.	75.78	1.66	21.05
Gilcrease	14.0	42.0	588.	101.36	3.5	17.23
Germany-Harris	44.8	22.0	983.	269.33	3.73	27.39
Glasscock-Snoddy	3.19	28.0	89.	42.90	1.69	49.20
Midas Oil-McCreary	2.00	37.0	74.	43.11	1.0	58.26
Whittington, Cent. Reb. Ch.	2.30	57.0	131.	45.46	1.15	34.70
Guebersen-Hopkins	8.0	63.0	504.	81.64	2.67	16.20
Rancho Oil Whitcoak School	2.0	69.0	138	25.92	2.00	18.78
Jones	3.26	57.0	186	27.48	3.26	14.77
Reddick & Hughes C. Smith	10.00	38.0	380	70.16	3.33	18.46
Navarro Oil-Tenery	10.00	26.0	260	66.61	3.33	25.62
Showers & Moncrief McPhearson	2.5	41.0	102.5	23.79	2.5	23.21
Stanolind O.& G. Bumpas	2.0	42.0	84.0	23.20	2.0	27.62
Doby	47.61	52.79	2513.0	368.06	3.66	14.65
Snoddy "A"	13.33	40.50	640	100.86	3.33	18.67
Snoddy "B"	13.33	48.0	640	124.32	2.67	19.43

Endorsed: No. 46 Civil. Filed 14th day of Feb., 1940. MAXEY HART, Clerk. (Signed) By J. E. Davis, Deputy. Pltffs Ex. 26.

476

PLAINTIFF'S EXHIBIT NO. 27.

JAN. 1, 1940.

COMPARISON OF ROWAN & NICHOLS' TODD "A" LEASE TO EAST TEXAS FIELD.

	East Texas Field	Rowan-Nichols Todd "A"	%
Total Proven Acreage	131,794	28.25	.0214349
Total Acre Ft. of Sand	4,990,350	26 27	.052642
Average Sand Thickness	37.86'	93.00	
Expected Recovery Per Acre Foot	927.40	927.40	
Revised Original Expected Recoverable Oil	4,628,054,299	2,434,656	.052606
Production to Jan. 1,1940	1,447,821,784	493,120	.0340594
Remaining Recoverable Oil	13,180,232,515	1,941,536	.0610501
Depletion in Percent	31.28%	20.25%	
Daily Rate of Production Jan. 1, 1940	690,000	260.52	.037762
Number of Days Required to Deplete at Present Rate	4609	7750	
Number of Years Required to Deplete at Present Rate (365 Days)	12.62	21.23	
No. of Years Req. to Deplete Present Rate (261 Days)	17.66	29.69	

ROWAN & NICHOLS OVER ALL PRODUCTION LOSS IN BARRELS TO JAN. 1, 1940 DUE TO PRESENT AND PAST PRORATION ORDERS 269,035.

ENDORSED: Nos. 31, 36 and 46 Civil. Filed 13th day of Feb. 1940. MAXEY HART, Clerk. (Signed) By J. E. Davis, Deputy. Pltffs Ex. 27.

4277

PLAINTIFFS' EXHIBIT NO. 29.

COMPARISON OF ACRE FEET OF SAND, WELL DENSITY, ALLOWABLE AND ALLOWABLE PER 100 ACRE FEET PER DAY FOR EAST TEXAS FIELD AND VARIOUS LEASES INCLUDING ROWAN & NICHOLS TODD "A" LEASE

- - - - - - - - - - -

Company and Lease		Acres	S.T.	Acre Feet Sand	Allow-ables	Density	Barrels per 100 acre feet sand
Rowan & Nichols	Todd "A"	28.25	93	2627.00	260.56	4.03	10.11
Hamill & Smith,	Archbault	.06	13	.78		.06	
	Barton	.76	43	32.68		.38	
	Benham	2.50	31	52.50		2.50	
	Butts	.22	51	11.22		.11	
	Butts "A"	.27	50	13.50		.13	
	Culp	.52	43	22.36		.10	
	Dumas	.06	16	.96		.06	
	Griffin	.10	31	3.10		.10	
	Everette	10.25	24	246.00		2.05	
	Faircloth	5.00	10	50.00		1.67	
	Herd	.34	45	15.30		.34	
	Hughey	.82	23	18.86		.21	
	Knowles	1.53	15	22.95		.22	
	Lacy	.26	50	13.00		.09	
	Sanders	.12	10	1.20		.12	
	Sugar	.08	30	5.40		.08	
Hamill & Smith Total				509.81	814.13		62.62
R.M.Wood - R.M.Wood		1	89	89	24.11	1	27.08
Pace Petroleum Corp.	Tripp Elder	1.4	45	83	88.77	.35	140.90
Ambasador Oil Co.	London School	3.47		242.09	308.85	.23	127.15
Total for East Texas Field		131,794	37.86	4,990,350	6,900.00	5.07	13.82

ENDORSED: NOS. 31, 36 and 46 CIVIL. Filed 14th day of Feb., 1940. MAXEY HART, Clerk. (Signed) By J. E. Davis, Deputy. Pltffs Ex. 29.

PLAINTIFFS' EXHIBIT NO. 30.

COMPARISON OF RESERVES NUMBER OF DAYS REQUIRED TO DEPLETE UNDER PRESENT ALLOWABLE AND PERCENTAGE OF INEQUITIES IF ROWAN & NICHOLS GETS 100% RECOVERY FROM START IF FIELD DEVELOPS.

- - - - - - - - - - -

	Original Reserves	Allowable	No.of days to deplete	Final Recovery	per cent of recovery
Rowan & Nichols Todd A	2,434,656	260.56	9343	2,434,656	100%
Pace Petroleum Tripp Elder	58,426	80.77	723	754,993	1,292%
Ambassador London School Lot	225,265	308.85	793	2,635,600	1,170%
R. M. Wood R. M. Wood	82,538	24.11	3,423	225,329	273%
Hamil & Smith All leases	472,798	814.13	501	8,794,042	18,599%

ENDORSED: NOS. 31, 36 and 46 CIVIL. Filed 14th day of Feb., 1940. MAXEY HART, Clerk. (Signed) By J. E. Davis, Deputy. Pltffs Ex. 30.

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[fol. 669] PLAINTIFFS' EXHIBIT No. 31

Exhibit A

Houston, Texas, June 16, 1939.

To the Honorable Railroad Commission of Texas:

Now comes Humble Oil & Refining Company, hereinafter sometimes called "Applicant," and respectfully presents this as its motion, requesting the Commission to amend and modify its statewide order dated April 26, 1939 as written and as construed, administered and applied, and to write, construe, administer and apply all future orders fixing the allowable production for the East Texas field and allocating such allowable production between various properties in the field in such manner as to allocate to Applicant and permit Applicant to produce currently its fair share of such allowable production of oil and in support of this motion, Applicant respectfully says:

1. Applicant is the owner and operator of numerous producing oil and gas mineral leases in the East Texas Field. Its leases in general extend from the northern limits of production to the southern portion of the field. For the most par-, its leases are situated along an axis running in a northerly and southerly direction near the middle of the field; that is to say, in the main, its leases are located in the so-called fairway or in that portion of the field where the producing sands have the greatest thickness and the largest quantity of recoverable oil in place. To be more specific, it owns a number of leases in the M. J. Pru and Francisco Cordova Surveys in the southern portion of the field, a large block of leases in what may be designated as the London area in the field, another block of leases southwest of the town of Kilgore and numerous other leases along the fairway [fol. 670] extending in a northerly direction from the city of Kilgore. A few of its leases are situated west of the north-south axis of the field, while a few of its other leases may be said roughly to lie along the eastern side of the field. Altogether the producing leases operated by it in the East Texas Field occupy in excess of 11% of the producing acreage in the field and contain approximately 14% of the recoverable oil and gas reserves in the field.

2. Applicant has drilled its leases in the field down to an average density of approximately one well to each 5.83 acres

of land. It has drilled such number of wells and has so spaced its wells on its leases as to be reasonably able to produce the recoverable oil under its properties without physical waste. Notwithstanding this fact, there are numerous areas in the field offsetting various properties owned by the Applicant which are drilled to a much greater density than are Applicant's properties; and since the Railroad Commission has prescribed an almost equal allowable for all wells in the field, it follows that in many places in the field the Applicant's properties are being severely drained by wells on adjacent properties or other properties in the vicinity of its leases. Not only this, but the method employed by the Commission in fixing the allowable for wells in the field causes non-uniform withdrawals. The withdrawals are excessive in localized areas where wells are densely drilled, while there are much smaller withdrawals per acre in other areas which are not so densely drilled,—thus causing an uneven rise of the water table and uneconomic or wasteful use of the reservoir energy. The allocation of allowables as between wells and properties in the field has no relation whatsoever to the actual recoverable reserves of oil under the various properties in the field.

[fol. 671] Applicant further says that as a consequence of the method by which the Commission allocates the allowable production of oil between the various wells and properties in the field, it is permitted to produce only approximately 9/90% of such total allowable for the field, while, as stated above, it is the owner of and is entitled to produce approximately 14% of the recoverable oil in the field. As a consequence, under the existing proration order and under the plan of production provided for in the order as it is actually construed, applied and administered, the Applicant is being deprived of the opportunity to produce its fair share of the oil in the field; and if orders of similar character are promulgated in the future, the Commission will thereby continue to deny to this Applicant the right to produce its fair share of the recoverable oil in the field, and in effect will confiscate vast quantities of oil, of which the Applicant is the owner, and which it is justly entitled to produce. This would amount to approximately 4% of the total recoverable reserves in the field if the present order or orders similar in effect to it were continued in force.

3. Applicant further shows to the Commission that heretofore uncontradicted evidence has been introduced at numerous statewide hearings held by the Commission to the effect that the total amount of oil which should be withdrawn from the East Texas Field during any one day on the average should not exceed 380,000 barrels, and that if the average daily allowable production from the field should materially exceed that figure, the bottom hole pressures will drop at an inordinately rapid rate and physical waste of oil and gas will result therefrom. According to the uncontradicted evidence before the Commission, therefore, the top average daily production from the East Texas Field [fol. 672] should not exceed approximately 380,000 barrels per day.

4. Under the law, it is the duty of the Railroad Commission to allocate the allowable production for the field between the various producing properties situated in the field on a reasonable basis in such manner as to afford to each operator a fair opportunity to produce his share of the recoverable oil in the field. The record of the evidence heretofore introduced in various statewide hearings before the Railroad Commission clearly shows that in the statewide order of the Railroad Commission issued under the date of April 26, 1939, fixing the basis upon which the allowable production for the East Texas Field is allocated between the various properties in the field as that order has been construed, applied and administered by the Commission, affords to many operators in the field an opportunity to produce far in excess of their fair share of the current allowable production from the field and at the same time restrain many other operators, including the Applicant, from producing their fair share of the current field allowable. Any other order based upon a similar principle and having future application, would have the same effect. The result is, therefore, that Applicant's oil is being taken from it currently in large quantities and is given to other operators whose properties are more densely drilled than are Applicant's properties. The order of the Commission complained of and any similar order that may hereafter be promulgated by the Commission is unreasonable, arbitrary, discriminatory, confiscatory and void as to Applicant and all those who may be similarly situated and deprives the Applicant

of its property without compensation and without due process of law and denies to the Applicant the equal protection [fol. 673] of the law in violation of the Fourteenth Amendment to the Constitution of the United States and deprives the Applicant of its liberty, property, privileges and immunities without due course of the law of the land in violation of Sections 13 and 19 of Article 1 of the Constitution of the State of Texas and deprives Applicant of its equal rights in violation of Section 3 of Article 1 of the Constitution of the State of Texas. Applicant further says that said order of April 26, 1939 as written and as construed, applied and administered by the Commission is, so far as Applicant is concerned, in direct violation of the principle announced by the United States District Court for the Western District of Texas, Austin Division, in Cause 624, in Equity, styled, Rowan & Nichols Oil Company, Complainants, v. Railroad Commission of Texas, Respondents, in a memorandum opinion handed down on June 12, 1939.

5. Applicant would respectfully call the Commission's attention to the fact that heretofore at different statewide hearings, ample evidence has been introduced upon which it could base a reasonable order allocating the allowable production in the East Texas Field between the various properties therein. Particular reference is made to the following statewide hearings; that of May 15, 1933; that of August 19-20, 1935 and that of August 26-27, 1935. The record of testimony in those hearings has been reintroduced from time to time at statewide hearings held by the Commission since those dates and in particular those records were reintroduced in evidence at the statewide hearing of the Commission held in the City of Austin on June 12, 1939. The attention of the Commission is respectfully called also to statements made by Mr. R. E. Hardwicke and Mr. Hines H. Baker at the statewide hearing on June 12, 1939, in which [fol. 674] they invited the attention of the Commission to the record previously introduced and to the fact that those records furnished the Commission with ample evidence upon which to enter and enforce reasonable and valid orders fixing the allowable production for the East Texas Field and allocating such production on an equitable basis between the various properties in that field.

6. Should the Commission feel that it should be in possession of additional facts before granting to Applicant the

relief herein requested, or should the Commission be of the opinion that a further hearing should be had on the matters raised in this motion, Applicant respectfully requests that the Commission grant it a hearing immediately in order that the relief prayed for may be granted in the statewide order of the Commission that will be issued for the month of July, 1939, in which the allowable production for the East Texas Field and the basis for allocating the production between properties in the East Texas Field will be fixed.

Wherefore, the premises considered, your Applicant respectfully prays that the Commission's statewide order dated April 26, 1939, and the schedule of allowable production made pursuant thereto, be so amended as at once to permit your Applicant to produce its fair share of the recoverable oil in the East Texas Field, being not less than 14% of the allowable fixed for the entire field, and that in any and all future orders which may be promulgated by the Commission fixing the allowable production for the East Texas Field and allocating such production between the various properties in the field, Applicant be permitted cur-
[fol. 675] rently to produce its fair share of the total field allowable which should at all events equal 14% of the total field allowable.

Respectfully submitted, Humble Oil & Refining Company, by Rex G. Baker, Attorney.

Endorsed: Nos. 31, 36 and 46 Civil. Filed 14th day of Feb., 1940. Maxey Hart, Clerk. (Signed) By J. E. Davis, Deputy. Pltffs. Ex. 31.

[fol. 676] PLAINTIFFS' EXHIBIT No. 34

Railroad Commission of Texas, Oil and Gas Division

Oil and Gas Docket No. 120

In re: Conservation and Prevention of Crude Petroleum Oil and Natural Gas in the East Texas Field

Austin, Texas, September 2, 1931.

Special Order Fixing Rules and Regulations for the Prevention of Physical Waste of Crude Petroleum Oil and Natural Gas in What is Known as the East Texas Field Composed of Upshur, Smith, Rusk and Gregg Counties, Texas

Whereas, the recently adjourned Special Session of the Forty-second Legislature enacted a comprehensive amendment to the oil and gas conservation laws of the State of Texas, re-defining "waste" of crude petroleum oil and natural gas and prescribing the powers of the Railroad Commission of Texas in preventing waste thereof; and

Whereas, immediately upon the adjournment of said First Called Session of the Forty-second Legislature this Railroad Commission promulgated an order directing that a special hearing should be held in the City of Austin, Texas, on the 25th day of August 1931, to determine what field rules and regulations, if any, should be prescribed, to carry out the policies underlying the new legislation, in the so-called East Texas field consisting of Upshur, Smith, Rusk and Gregg Counties, Texas. Pursuant to statutory notice, this hearing was held and evidence was offered tending to show that waste of crude petroleum oil and natural gas is now taking place or was taking place in said East Texas field as defined herein prior to and at the time of the shut-down of said field on or about the 17th day of August 1931, and [fol. 677] that waste of said oil and gas is threatened in said East Texas field in the respects hereinafter prescribed will prevent or tend to lessen the waste of said oil and gas in said field.

In the recently enacted legislation the Legislature *fo* Texas has provided that waste shall not be construed to mean "economic waste"; and further that the Railroad Commission of Texas "shall not have power to attempt by

order or otherwise directly or indirectly to limit the production of oil to equal the existing market demand for oil". In view of this legislative mandate the Railroad Commission has deemed it improper to consider any evidence at the hearing which convened on August 25, 1931, and was concluded on August 28, 1931, dealing with economic conditions in the oil industry. Accordingly, at the hearing mentioned no evidence was heard or considered dealing with price or with the limitation of production with a view of stabilizing or raising the price of crude petroleum oil.

On consideration of all of the evidence adduced at said hearing the Railroad Commission of Texas is of the Opinion and so Finds and Orders that the following rules and regulations are reasonable and necessary and will prevent, or greatly minimize, the waste of crude petroleum oil and natural gas in the East Texas field.

1. That present producing areas and extensions thereof in the counties of Gregg, Upshur, Smith and Rusk, Texas, shall constitute and be known as the "East Texas field".

2. It appearing from the evidence that the spacing of wells in said East Texas field, under the terms and provisions of the Railroad Commission's oil and gas conservation Rule 37 threatens to cause actual physical waste due to [fol. 678] the too rapid dissipation of gas energy in the production of oil and also due to the too rapid encroachment of water, that in the interest of preventing actual physical waste of oil and gas in said East Texas field, it is desirable to modify said Rule 37 as applied to said field. Therefore, it is here now ordered by the Railroad Commission that said Rule 37, insofar as it applies to the East Texas field, be modified and the following rule is provided: "No well for oil or gas shall hereafter be drilled nearer than 660 feet to any other completed or drilling well on the same or adjoining tracts of land and no well shall be drilled nearer than 330 feet to any property line; provided, that the Commission, in order to prevent waste and to protect vested rights, shall and will grant exceptions permitting drilling within shorter distances as above described upon application filed fully stating the facts, statutory notice thereof having first been given to all adjacent lessees or operators thereof; and provided further that this modification of Rule 37 shall not be applied against wells already begun or offsets

thereto". It is not the intention of the Railroad Commission to repeal Rule 37 by this order, but only to provide a special rule applicable only in said East Texas field.

3. All wells hereafter completed in said East Texas field shall be equipped with and produced through tubing of not more than two and one-half (2½) inches in diameter, and be bottomed not higher than the top of the producing oil sand. All wells heretofore completed and not tubed shall be tubed in accordance with the provisions of this order immediately after this order becomes effective. All flowing wells in said East Texas field shall also be equipped with adequate choke devices.

[fol. 679] 4. Evidence having been offered showing that there is a water table underlying the western side of said East Texas field and that some wells are now producing salt water, and that there is a threatened further intrusion of said salt water, therefore, it is here now ordered by the Commission that within five (5) days after this order becomes effective the owners of every well in said East Texas field now producing salt water shall plug same back by filling said hole with cem-*in* to such a point that the bottom of the hole will be at least ten (10) feet above the water table, if the thickness of the sand will permit, and if any well hereafter shall produce salt water the owner thereof shall immediately plug same off in like manner. All plugging work required hereunder shall be subject to the supervision and approval of the deputy oil and gas supervisor in charge. It shall further be the duty of said deputy oil and gas supervisor in said field to make constant investigations to determine what wells are producing salt water and to see that the owners of all wells producing salt water comply with the requirements hereof.

5. It appearing from the evidence that actual physical waste has probably resulted in said East Texas field by the drilling of wells to a depth below the water table, or too near the water table: It is, therefore, ordered that hereafter no well shall be drilled into the producing oil sand more than two-thirds (⅔rds) of the distance from the top of the sand to the known water level. Immediately upon the completion of any well hereafter completed the owner or operator thereof shall advise the deputy oil and gas supervisor in whose territory the well is located the exact depth

of such well and the depth into which said oil sand was penetrated and no person shall be permitted to operate [fol. 680] any well not completed in conformity herewith.

6. The Legislature of Texas in the recently enacted conservation statute has provided that the operation of any oil well with the gas-oil ratio exceeding that fixed by the Railroad Commission shall be regarded as waste. The Railroad Commission is in full accord with the policy thus announced. On several occasions it has requested the enactment of such legislation and now desires to do everything in its power to carry out the legislative will. The evidence offered at the hearing, however, insofar as it dealt with the oil-gas ratios in the East Texas field was very meager and unsatisfactory. It appears that the operators in said field have not made accurate and reliable tests to determine the gas-oil ratios of their wells and have not kept adequate and accurate records. The Railroad Commission feels that further investigation must be made under its supervision before it can prescribe any comprehensive and adequate regulation dealing with gas-oil ratios in said field. Accordingly, it is here ordered that it shall be the duty of the Railroad Commission's Agents and employees in the East Texas field to immediately begin the collection of data relating to gas-oil ratios and it shall be the duty of the owner or operator of each well in said field to furnish all information and data that may be requested by any agent or representative of said Railroad Commission, and further, shall equip his well or wells with necessary equipment for metering gas and taking pressures as, if, and when required by the Railroad Commission.

The Railroad Commission, while believing, as above indicated, that the evidence offered at said hearing is not [fol. 681] sufficient for an order fixing an oil-gas ratio for the oil wells in said fields, yet feels that there was evidence suggesting that the Commission should do something to prevent as far as possible, the wasteful utilization of gas energy in the production of oil, while the Commission is conducting its investigation as provided for herein. Evidence was offered before the Commission tending to show that the best results up to date in the use of gas energy have been obtained when the oil wells in said East Texas field were producing at the rate of between 200 and 300 barrels of oil per day.

It is, Therefore, Ordered by the Railroad Commission that the production of oil from each and every well in said East Texas field shall be limited to 225 barrels in any one day for the period of time covered by this order or until the Railroad Commission has completed its investigation work in said field and has promulgated such further orders as may be deemed necessary to secure a proper and efficient use of the gas energy in the production of oil in said field. Provided further that no operator shall be permitted to arbitrarily close his wells or any well down for one day or more and later undertake to produce said well or wells at a rate above 225 barrels sufficient to make up for the oil not produced when said well or wells were arbitrarily shut down, but in case a well or wells are unavoidably shut down for a period of one day or more, then the Commission may, in its discretion, grant a special concession to permit such producer to make up his daily average in production. Provided, however, that no well shall be permitted to produce with a gas-oil ratio in excess of 700 cubic feet of gas per barrel of oil.

[fol. 682] 7. No air or gas lift artificially applied shall be used in the East Texas oil field.

8. No well shall be permitted to clean itself and begin the flow of oil into or upon the derrick or derrick floor and in cleaning itself it shall be through a choke and an outlet shall be provided with a terminus into a pit at least 40 feet from the edge of the derrick floor or from any building, tank, or other structure which might constitute a fire hazard.

9. Each well shall be equipped with a blow-out preventer before drilling into the oil producing sand.

10. No boiler or electric generator shall be placed nearer than 150 feet to any producing well and before any well is brought into production boilers shall be moved back to conform to this rule.

11. All wells shall be completed in the daylight hours before sunset.

12. No well shall be brought into production until a duly authorized agent of the Commission shall issue a permit to the effect that such well has been properly completed and equipped in accordance with the rules and regulations of the Commission. However such permit shall not be required or

shall be waived if, after 72 hours after written notice to said agent, inspection is not made.

13. All conservation rules of the Railroad Commission heretofore promulgated from time to time, applicable in the East Texas Field, shall still be enforceable unless in conflict herewith. This does not include former proration orders in said field.

14. The terms "Commission" and "Railroad Commission" as used in this order shall mean the Railroad Commission of Texas. And, further, the terms "Supervisor", [fol. 683] "Deputy Supervisor", "agents", "Employees", etc., as used in this order shall mean employees of the Railroad Commission of Texas only.

15. Nothing contained in this order shall be construed to relieve any party, any common pipeline carrier, or any common purchaser from the duties and obligations imposed by Chapter 36, page 17 of the Acts of the Forty-first Legislature at its Fifth Called Session, commonly known as the "common purchasers act", and all amendments thereto including an act passed by the First Called Session of the Forty-second Legislature, commonly referred to as H. B. 19, nor to modify or change any provisions of said acts.

16. This order shall become effective at 7 a. m., September 5, 1931, and shall remain in full force and effect until 7 a. m., October 31, 1931, unless repealed, changed or modified by the Railroad Commission of Texas at an earlier date. It is distinctly understood that this cause is held open on the docket during said period and the Railroad Commission shall have the right and power to set aside, change or modify said order in any respect, based upon evidence which was adduced at the hearing in Austin on August 25, 1931 to August 28, 1931, inclusive, without further notice.

C. V. Terrell, Chairman, Railroad Commission of Texas; Lon A. Smith, Member Railroad Commission of Texas; Pat M. Neff, Member Railroad Commission of Texas.

Attest: (S.) C. F. Petet, Secretary Railroad Commission of Texas. (Seal.)

[fol. 684] STATE OF TEXAS,
County of Travis:

I, C. F. Petet, Secretary of the Railroad Commission of the State of Texas, do hereby certify that the attached order, described as follows:

Order of the Railroad Commission of Texas dated September 2nd, 1931, entitled: "Special Order Fixing Rules and Regulations for the Prevention of Physical Waste of Crude Petroleum Oil and Natural Gas in What is Known as the East Texas Field Composed of Upshur, Smith, Rusk, and Gregg Counties, Texas" is a true and correct copy of the original order now on file in the Railroad Commission, and in my custody as Secretary and Custodian of the files of the Railroad Commission.

Witness my hand and seal of the Railroad Commission of Texas, this the 31st day of January, 1940.

(Signed) C. F. Petet, Secretary. (Seal.)

Endorsed: Nos. 31, 36 and 46 Civil. Filed 16th day of Feb., 1940. Maxey Hart, Clerk. (Signed) by J. E. Davis, Deputy Pltffs. Ex. 34.

[fol. 685] PLAINTIFFS' EXHIBIT No. 35

Railroad Commission of Texas

Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 & 146

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, March 23, 1936.

Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas

Whereas, After due notice hearings have been held at Austin, Texas, at various times, including hearing on March 18, 1936, with respect to the existence and imminence of

waste of oil and gas in the state of Texas, and the prevention thereof; and

Whereas, In view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and

Whereas, The Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning at 7 o'clock a. m., April 1, 1936, and ending at 7 o'clock a. m., May 1, 1936; and

Whereas, The Railroad Commission of Texas finds that waste exists or is imminent and that to prevent such waste of oil and gas, as the same is defined by the applicable Stat-
[fol. 686] utes, it is necessary to restrict the production of oil in the state of Texas as provided for herein, and

Whereas, The Railroad Commission's Special Order fixing Allowable Production of Crude Oil in the Various Fields and Districts in Texas, dated August 26, 1935, contains the following language:

"We further find from the evidence the more wells that are drilled the greater will be the ultimate recovery of oil and gas from any given pool."

By this language the Commission did not mean and did not find from the evidence that the closer wells are drilled the greater will be the ultimate recovery of oil and gas from any given pool, but by such language only meant and found from the evidence that the more wells that are drilled in conformity with the spacing rules as applicable to the various fields in Texas the greater will be the ultimate recovery of oil and/or gas from any given pool.

It was not then the intention and it is not now the intention of the Railroad Commission to abrogate or abandon any of the spacing rules now in effect and applicable to the various oil and gas fields in Texas, nor to militate against the fact basis on which the Commission's spacing rules are based.

Now, Therefore, In order to prevent the waste of oil and gas in the state of Texas, which will take place by authorizing production over the said period in excess of the reasonable market demand:

[fol. 687] It Is Hereby Ordered, That beginning at 7 o'clock a. m., Wednesday, April 1, 1936, and continuing to May 1, 1936; unless other periods are prescribed herein, the production of oil in the state of Texas, and the various fields therein, until further ordered, shall not exceed the amounts hereinafter shown as the allowable production thereof, and in order to adjust the current allowable production of crude oil in Texas, as nearly as may be, to the demand as shown, the allowable daily production of the various fields and districts in said State shall be limited to the amounts hereinafter specified and the following orders fixing such limitation on production in the various fields and districts are hereby adopted.

1. Rule 2 of Division 2, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than Sixty Thousand Eight Hundred (60,800) barrels of crude oil shall be produced from said district during any day of the effective period of this Order. Moore County shall not produce in excess of Fifteen Hundred (1500) bbl. per day. Moore County allowable is additional to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of One Thousand (1,000) barrels per day. The Osborne Area allowable is in addition to the Panhandle allowable.

2. Rule 23 (a) of Division 3, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Texas Field is hereby readopted and amended as follows:

Rule 23 (a). Whereas, The Railroad Commission of Texas finds from evidence submitted to it at a hearing held [fol. 688] in Austin, Texas, on March 18, 1936, and at previous hearings held before this regulatory body, that the reservior of the East Texas Field has its energy supplied by a hydrostatic drive which encroaches from the west to the east, and only a certain amount of crude oil can be withdrawn daily from the East Texas reservoir in order

to utilize to the greatest extent the energy necessary for the production and recovery of the greatest amount of oil ultimately from the reservoir. It has been recommended to the Commission by competent engineers that not more than 424,000 to 450,000 barrels of crude oil should be allowed to be produced from the East Texas reservoir in any one day in order that the reservoir might be depleted with the least amount of waste incurring. Evidence was also submitted to the Commission at these hearings that the production of from 425,000 to 450,000 barrels of crude oil will prohibit the coning of water; the uneven encroachment of water, and the subsequent trapping of much oil that otherwise under higher daily allowables of crude oil, would not be recovered.

Therefore, it is Further Ordered By the Railroad Commission of Texas, that during each twenty-four (24) hour period beginning at 7 o'clock a. m., Central Standard Time, April 1, 1936, the owner or operator or manager of each well in the East Texas Field shall be permitted, either collectively or individually, to produce daily from each well a maximum of Two Point Eighty Five (2.85%) Per Cent of its average hourly potential producing capacity as determined by the Commission.

3. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the North Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Sixty Thousand (60,000) barrels [fol. 689] of crude oil shall be produced from said district during any day of the effective period of this Order. Foard County shall not produce in excess of Five Hundred (500) barrels daily. Foard County allowable is in addition to North Texas allowable.

4. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Three Thousand and Eight (53,008) barrels of crude oil shall be produced from said District during any day of the effective period of this Order, which is distributed to the various counties as follows:

Brown	1727	Fisher	5875	Runnels	313
Callahan	1596	Haskell	18	Shackelford	6477
Coleman	1172	Irion	42	Stephens	4653
Comanche	74	Jones	3653	Throckmorton	464
Crockett (Todd)	10	McCullough	1	Taylor	126
Crockett (World)	1060	Palo Pinto	360	Upton (McCamey)	8782
Eastland	2936	Reagan (Big Lake)	9000	Young South/2	4323
Erath	112	Reagan (Grayson)	172	Webb-Ray	62

5. Rule 4 of Division 7, as contained in an Order of this Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

Rule 4. Not more than One Hundred Fifty Three Thousand Four Hundred Six (153,406) barrels of crude oil per day shall be produced from said District during any day of the effective period of this Order, which shall be distributed to the various fields therein as follows:

[fol. 690]

Bashara	22	Iaatna-E. Howard	4800	Sand Hills (Ordovician)	60
Brown-Altman	1389	Johnson	30	Sayre	4350
Church-Fields	6960	Keyes	100	Scarbrough	1885
Cowden, North	6350	Keystone	1268	Sealey	535
Cowden, South	400	Leck	500	Shipley	1580
Crane-Cowden	572	Masterson	211	Tobarg	2200
Deep Rock	350	Means	1466	Taylor-Link	1350
Dobbs	100	McClintic	932	Waddell	2012
Edwards	16	McKinzie	5	Walker	10
Emperor	515	Monroe	25	Ward, North	10,075
Foster	180	Netterville	99	Ward, South	14,170
Fuhrmans	750	Northwest	28	Westbrook	867
Goldsmith	414	Parker	50	Wheat	1,850
Gulf-McElroy	4640	Pecos Valley	422	White & Baker	3
Halley	149	Penwell	6718	Yates	38,837
Harper	96	Richards	10		
Hendricks	13815	Sand Hills	240		
Howard-Glasscock	20000				

6. Rule 2 of Division 4, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Thousand Nine Hundred Fifty (50,950) barrels of crude oil per day shall be produced from said fields in said District during any day of the period of April 1, 1936, to May 1, 1936; said amounts shall be allocated to the various fields in the following amounts:

Bethany	16	Mexia	2187	South Bosque	11
Boggy Creek	573	Post Oak	1	Van	35,733
Camp Hill	600	Potter	70	Van Shallow	153
Cayuga	5274	Pottsboro	4	Trinity	1,091
Curry	127	Rusk	225	Wortham	95
Corsicana	411	Richland	28	Worthem (Shallow)	12
East Freestone	8	Powell	2321		
Long Lake	750	Rodessa	1200		

7. Rule 2 of Division 8, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Forty Three Thousand Two Hundred Sixty Three (143,263) barrels of crude oil shall be produced in said District during any day of the effective date of this Order, and same shall be distributed as follows:

[fol. 691]

Division I

Alta Vista	5	Espada Mission	1	Minerva Rockdale	227
Bateman	206	Gas Ridge	8	Noack	325
Bob Rose	25	Hilbig	791	Pearsall	1000
Buchanan	39	Jones	0	Schimmel-Batts	1
Callaham	148	Jacobs	610	Somerset	700
Carroll	28	Kimbro		Southton	67
Cedar Creek	44	Kimbro New	48	Staples	3
Cedar Creek (N)	54	Larremore	40	Taylor Ina	5
Chapman-Abbott	333	Loma Alto	80	Thrall	46
Chicon Lake	17	Lowe	0	Salt Flat	4268
Clark	500	Luling-Branyon	5923	Von Ormy	83
Cooksey	12	Lytton-Springs	371	Yoast	50
Darst Creek	8986	Manford	33	Zoborski	4
Dale	160	Matthews	52		
Dunlap	10	Meaders	0		25,572
Eckert	269				

Division II

Caesar	1293	Mineral	0	Refugio (Deep Sand)	111
Colotta Creek	780	Mt. Lucas	60	Refugio (New)	2325
Diamond Half	80	Normanna	12	Refugio (Old)	2520
Dinero	92	O'Connor-McFadden	275	Hords Creek	90
Dirks	5280	Placedo	2050	Tuleta	1400
Fort Merrill	57	Pettus	1408	Vanderbilt	100
Greta	14930	Pettus (New)	1000	Worthington	74
Greta Deep	1180	Port Lavaca	700	Whittington	6
Keeran	300	Quintanna-O'Connor	3200		41,452
McFadden	26	Ray	1831		
Maurits	150				
McNeil	122				

Division IV

Albercos	100	Eagle Hill	426	Los Olmos	146
Alworth	0	Escobas	1109	Mercedes	140
Angelita	0	Gov't Wells (N)	11,704	Mirando City	351
Aviators	408	Gov't Wells (S)	6,021	Mirando Valley	32
Baldwin	874	Guerra	412	Moca	666
Barbacoas	15	Hagist	50	O'Hern	2800
Bruni	2200	Henne-Winch-Farris	10	Piedra Lumbre	360
Carolina-Tex	5	Hoffman	340	Piedras Pinta	0
Charco-Redondo	10	Jennings	655	Plymouth	8130
Clara Driscoll	150	Kingsville	60	Premont Prospect	0
Cole East	32	Kohler	97	Randado	320
Cole West	593	Laurel	40	Rio Grande City	235
Cole Middle	56	Loma Novia	11,970	Roma	3
Cuellar	114	Loma Vista	75	Corpus Christi	4306
Comitas	10	Lopez	2,520	Sinton	10
Driscoll	360			Seven Sisters	3500

Division IV (Continued)

S. R. C.	26	Saxet (New)	6180	White Point	20
Sam Fordyce	5126	South Clarkwood	20		
Sarnosa	957	Taft	300		76,239
Saxet (Old)	2195	[fol. 692]			

8. Rule 2 of Section A, Division 8, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Seventy Nine Thousand and Thirty Four (179,034) barrels of crude oil shall be produced from said fields of said district during any day of the effective period of this Order, which shall be distributed to said fields as follows:

Amelia	150	High Island	6780	Pickett Ridge	1050
Allen Dome	16	Hankamer	1801	Pierce Junction	3315
Anahuac	5900	Hankamer (New)	587	Pierce Junction (Vicksburg)	70
Ariola	1375	Hardin	365	Raccoon Bend	2883
Bay City	750	Hastings	5900	Raccoon Bend (Cockfield)	3000
Big Creek	1006	Hull (Old)	2915	Rockland	-0-
Blue Ridge	1555	Hull (New)	2710	Saratoga	973
Boling	735	Humble	3430	Schwab	60
Brenham	19	Lost Lake	200	South Houston	1425
Brookshire	15	Louise	1540	Sugarland	5580
Buckeye	218	Livingston	3188	Sour Lake	1572
Batson	743	Manvel (Miocene)	5000	South Liberty	646
Batson (New)	1497	Manvel (Oligocene)	4500	Spindletop	2507
Barbers Hill	17,200	Markham	1371	Thompson	10,738
Clay Creek	1,133	Mykawa	229	Tomball	7,500
Cleveland	962	Mykawa (New)	3927	West Columbia	2,340
Conroe	46,025	Nash Dome	36	Withers	150
Damon Mound	497	Old Ocean	424	Turtle Bay	300
Dickinson	1565	North Dayton	133	Shepherd's Mott	9
Esperson Dane	1340	Orchard	628		
Fannett	1013	Orange	680		
Goose Creek	3053	Port Neches	1805		
Gillock	Shut-in				

It is Further Ordered That allowable oil in the foregoing Order is oil measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9) and corrected to sixty (60) degrees Fahrenheit.

[fol. 693] It is Further Ordered that this Cause be held open on the Docket for such further orders as may be necessary and supported by evidence of record in above Cause.

Railroad Commission of Texas, Ernest O. Thompson, Chairman; C. V. Terrell, Commissioner; Lon A. Smith, Commissioner. (Seal.)

Attest: C. F. Petet, Secretary.

STATE OF TEXAS,
County of Travis:

I, C. F. Petet, Secretary of the Railroad Commission of Texas, do hereby certify that the attached order of the Railroad Commission of Texas, described as follows:

Order dated March 23rd, 1936 entitled "Special order fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas,

is a true and correct copy of the original now on file in this office as revealed by the records of this office, and in my custody as secretary and custodian of the files of the Railroad Commission of Texas.

Witness my hand and the seal of the Railroad Commission of Texas, this the 7th day of August, A. D. 1939.

(Signed) C. F. Petet, Secretary. (Seal.)

Endorsed: Nos. 31, 36 and 46 Civil. Filed 16th day of Feb., 1940. Maxey Hart, Clerk. (Signed) by J. E. Davis, Deputy. Pltffs. Ex. 35.

[fol. 694] PLAINTIFFS' EXHIBIT No. 36

Railroad Commission of Texas, Oil and Gas Division

Oil and Gas Docket Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132 & 146

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas, February 24, 1936.

Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and Districts in Texas

Whereas, after due notice hearings have been held at Austin, Texas, at various times, including hearing on February 18, 1936, with respect to the existence and imminence of waste of oil and gas in the State of Texas, and the prevention thereof; and

Whereas, in view of the evidence, including among other matters the physical conditions in the various fields, the

transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and

Whereas, the Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning at 7 o'clock a. m., March 1, 1936, and ending at 7 o'clock a. m., April 1, 1936; and

Whereas, the Railroad Commission of Texas finds that waste exists or is imminent and that to prevent such waste of oil and gas, as the same is defined by the applicable Statutes, it is necessary to restrict the production of oil in the state of Texas as provided for herein, and

[fol. 695] Whereas, the Railroad Commission's Special order Fixing Allowable Production of Crude oil in the Various Fields and Districts in Texas, dated August 26, 1935, contains the following language:

"We further find from the evidence the more wells that are drilled the greater will be the ultimate recovery of oil and gas from any given pool".

By this language the Commission did not mean and did not find from the evidence that the closer wells are drilled the greater will be the ultimate recovery of oil and gas from any given pool, but by such language only meant and found from the evidence that the more wells that are drilled in conformity with the spacing rules as applicable to the various fields in Texas the greater will be the ultimate recovery of oil and/or gas from any given pool.

It was not then the intention and it is not now the intention of the Railroad Commission to abrogate or abandon any of the spacing rules now in effect and applicable to the various oil and gas fields in Texas, nor to militate against the fact basis on which the Commission's spacing rules are based.

Now, Therefore, in order to prevent the waste of oil and gas in the state of Texas, which will take place by authorizing production over the said period in excess of the reasonable market demand:

It is Hereby Ordered, that beginning at 7 o'clock a. m., Sunday, March 1, 1936, and continuing to April 1, 1936;

unless other periods are prescribed herein, the production of oil in the state of Texas, and the various fields therein, until further ordered, shall not exceed the amounts hereinafter shown as the allowable production thereof, and in [fol. 696] order to adjust the current allowable production of crude oil in Texas, as nearly as may be, to the demand as shown, the allowable daily production of the various fields and districts in said State shall be limited to the amounts hereinafter specified and the following orders fixing such limitation on production in the various fields and districts are hereby adopted.

1. Rule 2 of Division 2, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Eight Thousand and Eight Hundred (58,800) barrels of crude oil shall be produced from said district during any day of the effective period of this Order. Moore County shall not produce in excess of Fifteen Hundred (1500) barrels per day. Moore County allowable is additional to Panhandle allowable. The Osborne Area in Wheeler County shall not produce in excess of One Thousand (1,000) barrels per day. The Osborne Area allowable is in addition to the Panhandle allowable.

2. Rule 23 (a) of Division 3, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Texas Field is hereby readopted and amended as follows:

Rule 23 (a). Whereas, the Railroad Commission of Texas finds from evidence submitted to it at a hearing held in Austin, Texas, on February 18, 1936, and at previous hearings held before this regulatory body, that the reservoir of the East Texas Field has its energy supplied by a hydrostatic drive which encroaches from the west to the east, and only a certain amount of crude oil can be withdrawn daily from the East Texas reservoir in order to utilize to the [fol. 697] greatest extent the energy necessary for the production and recovery of the greatest amount of oil ultimately from the reservoir. It has been recommended to the Commission by competent engineers that not more than 425,000 to 450,000 barrels of crude oil should be allowed to be produced from the East Texas reservoir in any one day

in order that the reservoir might be depleted with the least amount of waste incurring. Evidence was also submitted to the Commission at these hearings that the production of from 425,000 to 450,000 barrels of crude oil will prohibit the coning of water; the uneven encroachment of water, and the subsequent trapping of much oil that otherwise, under higher daily allowables of crude oil, would not be recovered.

Therefore, it is Further Ordered by the Railroad Commission of Texas, that during each twenty-four (24) hour period beginning at 7 o'clock a. m., Central Standard Time, March 1, 1936, the owner or operator or manager of each well in the East Texas Field shall be permitted, either collectively or individually, to produce daily from each well a maximum of Two Point Eighty Five (2.85%) Per Cent of its average hourly potential producing capacity as determined by the Commission.

3. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the North Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Eight Thousand Five Hundred (58,500) barrels of crude oil shall be produced from said district during any day of the effective period of this order. Foard County shall not produce in excess of Five Hundred (500) Barrels Daily Foard County Allowable is additional to North Texas allowable.

[fol. 698] 4. Rule 2 of Division 5, as contained in an Order of this Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Thousand Six Hundred Fifteen (50,615) barrels of crude oil shall be produced from said District during any day of the effective period of this Order, which is distributed to the various counties as follows:

Brown	1761	Fisher	5423	Shackelford	6443
Callahan	1556	Haskell	18	Stephens	4691
Coleman	1165	Irion	47	Throckmorton	453
Comanche	74	Jones	3338	Taylor	129
Crockett (Todd)	10	McCullough	6	Upton (McCamey)	7782
Crockett (World)	1060	Palo Pinto	382	Young South #2	4503
Eastland	3060	Reagan (Big Lake)	8020	Runnels	370
Erath	112	Reagan (Grayson)	172	Webb-Ray	40

5. Rule 4 of Division 7, as contained in an Order of this Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

Rule 4. Not more than One Hundred Forty Seven Thousand Nine Hundred Sixty Five (147,965) barrels of crude oil per day shall be produced from said District during any day of the effective period of this Order, which shall be distributed to the various fields therein as follows:

Goldsmith	400	Iaatan-E. Howard	4,449	Shipley	1580
Bashara	102	Johnson	30	Taylor-Link	1350
Brown-Altman	371	Keystone	1,168	Tobarg	1825
Church-Fields	6960	Leck	500	Ward, North	12,000
Cowden, North	4350	Masterson	211	Ward, South	12,245
Cowden, South	400	McClintic	932	Westbrook	867
Crane-Cowden	572	McKinzie	10	Waddell	1,528
Deep Rock	300	Netterville	15	Walker	10
Edwards	0	Monroe	25	Wheat	1,850
Foster	100	Means	1,185	White & Baker	3
Fuhrmans	750	Parker	50	Yates	38,435
Gulf-McElroy	4640	Pecos Valley	372	Sand Hill (Ordovician)	150
Sayre	3650	Penwell	6,718	Emperor	415
Hendricks	14,600	Richards	10	Dobbs	100
Harper	96	Snyder	0		
Halley	149	Northwest	28		
Sand Hills	54	Scarbrough	1875		
Howard-Glasscock	20,000	Sealey	535		

[fol. 699] 6. Rule 2 of Division 4, as contained in an Order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than Fifty Thousand Two Hundred Twenty-Five (50,225) barrels of crude oil per day shall be produced from said fields in said District during any day of the period of March 1, 1936, to April 1, 1936; said amounts shall be allocated to the various fields in the following amounts:

Bethany	16	Post Oak	1	Van	35,733
Boggy Creek	573	Potter	70	Van Shallow	164
Camp Hill	675	Pottsboro	4	Trinity	1,085
Cayuga	5104	Rusk	300	Wortham	95
Curry	131	Richland	28	Wortham (Shallow)	12
Corsicana	434	Powell	2332	East Freestone	10
Long Lake	750	Rodessa	500		
Mexia	2197	South Bosque	11		

7. Rule 2 of Division 8, as contained in an Order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Thirty Two Thousand One Hundred Fifty Nine (132,159) barrels of crude oil shall be produced in said District during any day of the effective date of this Order, and same shall be distributed as follows:

[fol. 700]

Division I.

Alta Vista	5	Espada Mission	1	Pearsall	550
Bateman	206	Gas Ridge	8	Schimmel-Batts	1
Bob Rose	35	Hilbig	791	Somerset	700
Buchanan	41	Jones	0	Southton	67
Callahan	146	Jacobs	595	Taylor Ins	7
Carroll	28	Kimbro	47	Thrall	46
Cedar Creek	52	Kimbro (New)		Salt Flat	4,173
Cedar Creek (n)	26	Loma Alto	80	Von Ormy	80
Chapman-Ahbott	344	Lowe	0	Yoast	55
Chicon Lake	17	Luling-Branyon	5,550	Larremore	48
Clark	235	Lytton-Springs	377	Zoborski	10
Cooksey	13	Manford	30	Staples	3
Darst Creek	8,968	Matthews	51		24,366
Dale	160	Meaders	0		
Dunlap	10	Minerva Rockdale	220		
Eckert	276	Noack	314		

Division II.

Caesar	1,263	O'Connor-McFadden	275	Refugio (Old)	2,520
Coletta Creek	693	Placedo	1,902	Hords Creek	68
Dinero	135	Pettus	1,521	Tuleta	1,548
Dirks	5,040	Pettus (New)	1,000	Vanderbilt	10
Greta	14,930	Port Lavaca	850	Worthington	76
Greta Deep	1,180	Quintanna-O'Connor	3,000	Fort Merrill	170
Keeran	300	Ray Refugio (Deep Sand)	99	Maurits	150
McFadden	32	Refugio (New)	2,250	Whittington	1
McNeil	175			Diamond Half	0
Mineral	0				41,041
Mt. Lucas	60				
Normanna	12				

Division IV.

Albercos	100	Hagist	110	Rio Grande City	240
Alworth	0	Henne-Winch-Faris	10	Roma	3
Angelita	0	Hoffman	40	Corpus Christi	1,718
Aviators	408	Jennings	635	Sinton	50
Baldwin	874	Kingsville	56	Seven Sisters	2,520
Barbacosa	15	Kohler	115	S. R. C.	53
Bruni	2,200	Laurel	39	White Point	20
Carolina-Tex	5	Loma Novia	9,975	Sam Fordyce	4,686
Charco Redondo	10	Lopez	1,750	Sarnosa	957
Clara Driscoll	150	Los Olmos	137	Saxet (Old)	2,528
Cole East	32	Mercedes	165	Saxet (New)	4,967
Cole West	608	Mirando City	369	Taft	150
Cuellar	120	Mirando Valley	35	Cole Middle	56
Comitas	6	Moca	666	South Clarkwood	20
Driscoll	320	O'Hern	2,625	Loma Vista	75
Eagle Hill	425	Piedras Pintas	9	Piedra Lumbre	200
Escobas	1,160	Plymouth	6,790		66,752
Gov't Wells (N)	11,792	Premont Prospect	0		
Gov't Wells (S)	6,024	Randado	322		
Guerra	412				

[fol. 701] 8. Rule 2 of Section A, Division 8, as contained in an Order of this Commission dated October 17, 1933,

pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than One Hundred Sixty Eight Thousand Seven Hundred Seventy Four (168,774) barrels of oil shall be produced from said fields of said District during any day of the effective period of this Order, which shall be distributed to said fields as follows:

Allen Dome	15	High Island	6,780	Pickett Ridge	900
Anahuac	5,000	Hankamer	1,603	Port Neches	1,805
Ariola	1,375	Hankamer (New)	491	Pierce Junction	3,279
Bay City	500	Hardin	365	Pierce Junction (Vicksburg)	70
Big Creek	1,043	Hastings	5,200	Raccoon Bend	2,883
Blue Ridge	1,675	Hull (Old)	2,825	Raccoon Bend (Cockfield)	1,931
Boling	870	Hull (New)	2,846	Rockland	0
Brenham	18	Humble	3,430	Saratoga	839
Brookshire	15	Lost Lake	260	Schwab	60
Butkeye	174	Louise	1,540	South Houston	1,153
Batson	729	Livingston	3,100	Sugarland	5,580
Batson (New)	1,236	Manvel (Miocene)	4,000	Sour Lake	1,577
Berbers Hill	17,200	Manvel (Oligocene)	3,500	South Liberty	685
Clay Creek	1,133	Markham	1,105	Spindletop	2,377
Cleveland	853	Mykawa	280	Thompson	10,738
Conroe	44,025	Mykawa (New)	3,847	Tomball	6,250
Damon Mound	482	Nash Dome	38	West Columbia	2,340
Dickinson	1,465	North Dayton	142	Withers	150
Esperson Dome	1,340	Old Ocean	424	Turtle Bay	150
Fannett	973	Orchard	675		
Goose Creek	2,745	Orange	690		
Gillock	(Shut in)				

It Is Further Ordered That allowable oil in the foregoing Order is oil measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9) and corrected to sixty (60) degrees Fahrenheit.

It Is Further Ordered That this Cause be held open on the Docket for such further orders as may be necessary and supported by evidence of record in above cause.

Railroad Commission of Texas, Ernest O. Thompson, Chairman, C. V. Terrell, Commissioner, Lon A. Smith, Commissioner. (Seal.)

Attest: C. F. Petet, Secretary.

[fol. 702] State of Texas,
County of Travis:

I, C. F. Petet, Secretary of the Railroad Commission of Texas, do hereby certify that the attached order of the Railroad Commission of Texas, described as follows:

Order dated February 24th, 1936 entitled "Special Order Fixing the Allowable Production of Crude Oil in the Various Fields and District in Texas"

is a true and correct copy of the original now on file in this office as revealed by the records of this office, and in my custody as secretary and custodian of the files of the Railroad Commission of Texas.

Witness my hand and the seal of the Railroad Commission of Texas, this the 7th day of August, A. D., 1939.

(Signed) C. F. Petet, Secretary.

Endorsed: Nos. 31, 36 & 46 Civil, Plaintiffs' Exhibit No. 36. Files 16th day of February, 1940. Maxey Hart, Clerk. By J. E. Davis, Deputy.

[fol. 703] PLAINTIFFS' EXHIBIT No. 37

East Texas Field

Operator ..... Lease .....

1. How many wells are on this lease?

2. How many acres are in this lease?

3. What is the average thickness of the saturated Woodbine sand under this lease?

4. What is the average per cent porosity of the oil saturated section of the Woodbine Sand under this lease?

5. What is the average permeability of the oil saturated section of the Woodbine Sand under this lease?

6. What is the average per cent connate water in the Woodbine Sand under this lease?

7. What is the per cent of Shale in the Woodbine Sand under this lease?

8. What do you estimate to be the original reserve of recoverable oil in the Woodbine Sand under this lease?

9. What do you estimate to be the present reserve of recoverable oil in the Woodbine Sand under this lease?

[fol. 704] 10. How many barrels of oil have been produced from the wells located on this lease?

11. What do you estimate to be the reserve of recoverable oil in the East Texas Field at the present time?

12. What do you think the total allowable for the wells on this lease should be in order that you might recover

your fair share of oil in the East Texas Field, if the total allowable of the East Texas Field remains as it is at this time?

$$\frac{9{,}000}{4{,}173{,}933} \times \text{field allowable} = \text{lease allowable}$$

Pressure factor may also be considered. See covering letter.

13. Remarks:

Note: Please give number of acres in lease and general location of same on structure.

[fol. 705] PLAINTIFFS' EXHIBIT No. 38

August 8, 1939.

Honorable John E. Taylor, Chief Supervisor, Oil & Gas Division, Railroad Commission, Austin, Texas.

DEAR MR. TAYLOR:

In compliance with your request, we enclose to you herewith our answers to your questionnaire relating to the several leases which the Humble Company owns or operates in the East Texas Field. We have given the answers to the best of our ability in view of the limited amount of time at our disposal, and believe that the answers are correct.

You will notice that in answer to Questions 8, 9, and 11, we have answered in terms of acre-feet of sand. We thought it preferable to give this sort of an answer for the following reasons: Competent petroleum engineers and geologists will agree fairly well concerning the amount of oil per acre-feet in place in the East Texas Field. The percentage of the oil which can be recovered per acre-foot depends upon the manner in which the field is operated. If a proper allowable for the field and ratable production are maintained, a higher rate of recovery per acre-foot could reasonably be expected than if the allowable for the field is excessive, or if excessive concentrated withdrawals are permitted. The opinions of competent petroleum engineers [fol. 706] and geologists may vary as to what the actual recovery per acre-foot in the field will be in the future,

because of their differences in assumptions as to the conditions under which the field may hereafter be operated.

In answer to Question 12, we have suggested the following formula:

$$\frac{\text{Acre-feet of oil sand in lease}}{\text{Acre-feet of oil sand in field}} \times \text{field allowable.}$$

It is to be understood, however, that it may be entirely proper to apply the pressure factor or to consider the location of the lease on structure. There are other formulae which would probably give substantially the same result. It is our idea that whatever the formula may be, the object should be to prevent reasonably avoidable drainage between competing properties, which drainage is not substantially offset by counter drainage.

Whatever its legal rights may be, the Humble Company, as a practical matter, would offer no objection to an order applying the formula mentioned above or another formula achieving substantially the same result and, in connection therewith, prescribing a reasonable minimum unit allowable.

Yours very truly, Rex. G. Baker.

RGB-H. Encl.

[fol. 707] DEFENDANTS' EXHIBIT No. 8

Humble Oil & Refining Company
East Texas Field

Lease	Acres	Potential	Allowable
Adams	70.00	1,485	165.83
Alexander	25.00	345	26.32
Armstrong	155.70	29,405	1,067.77
Arnold, J. E.	43.50	1,430	123.70
Arnold, J. H.	81.00	10,590	460.80
Bagwell, B. J.	40.70	5,700	88.26
Barksdale, R. A. "A"	72.80	6,420	315.36
Barksdale, R. A. "B"	80.00	2,970	263.01
Barton, L.	62.20	8,550	378.15
Barton, T.	49.70	4,165	314.82
Bell, John	65.50	9,747	399.14
Blackwell, O	74.40	10,765	374.75
Blackwell, A. D.	245.79	53,931	1,731.76
Bowles, J. F.	100.50	17,270	724.29
Box, J. R.	165.70	23,705	980.83
Brightwell, C. A.	44.90	6,950	252.32
Caldwell, M. D.	73.10	11,600	468.66
Cameron, R. T.	50.00	4,651	189.17
Carlton School	4.00	600	25.40
Carter, A.	90.20	16,880	713.46
Castleberry, H.	110.00	2,840	241.41

DEFENDANTS' EXHIBIT No. 8

Humble Oil & Refining Company

East Texas Field

Lease	Acres	Potential	Allowable
Christian, L.	36.30	8,485	332.68
Clements, C. C.	75.20	5,175	266.67
Clements, E. W.	50.00	10,685	402.37
Crim, L. D.	914.51	161,133	6,098.31
DeGuerin, Lulu	12.00	1,885	73.11
Dennis, Sol	73.15	11,166	471.71
Edwards, Ethel	73.30	9,700	446.58
Edwards, J. K.	267.10	32,096	1,424.96
Elliott, J. R.	13.50	1,795	72.75
First State Bank	80.60	11,100	389.50
Florey, J. D. "A"	79.50	13,620	543.65
Florence Heirs	16.00	4,125	130.92
Fuller, J.	115.66	17,185	623.36
Gramling, R. P. alc-1	31.44	3,270	119.50
Glover, J. E.	131.00	15,997	683.15
Glover, S. A.	58.00	2,085	166.94
Gray, J. C.	12.50	480	41.34
Guerin, P. R.	129.50	21,860	871.93
Harris, T. B. & T. D.	175.18	21,265	841.28
Hedge, C. H.	7.82	180	8.40
Hill, Leah	55.30	7,025	299.44
Holland, W. W.	206.40	36,614	1,433.43
Holt, E. S.	51.43	8,150	321.32
Holt, Ida "A"	32.62	4,005	148.85
Holt, Ida "B"	91.45	12,960	533.99
[fol. 708]			
Holt, Ida "C"	99.00	10,705	448.73
Holt, O. R.	41.25	6,440	256.54
Hughes, A. L.	91.00	18,590	734.41
Hughes, W. R.	245.31	38,230	1,437.42
Joyner, D. C.	59.14	4,985	202.75
Joyner, D. C. "B"	7.50	1,250	44.98
Joyner, M.	20.55	1,295	67.70
Johnston, D. "A"	88.13	10,815	397.05
Johnston, D. "B"	57.80	9,425	318.92
Johnson, G. W.	97.15	21,830	771.79
Kangerga, M. & R. "A"	312.00	49,860	2,055.61
Kangerga, M. & R. "B"	124.60	11,180	505.46
Kee, W. B.	95.38	11,645	408.98
Killingsworth, Mattie	99.70	19,160	860.12
Knowles, J. A.	101.65	9,760	624.61
Ladd, D. "A"	35.00	5,650	346.21
Laird, B. F. "A"	156.90	28,010	1,144.25
Laird, R. H. & W. L.	61.60	11,330	376.63
Laird, S. S. alc A	230.00	29,225	1,407.77
Laird, S. S. alc B	425.00	36,245	2,213.36
Lawrence, H. M.	164.70	26,325	1,171.21
Lindsey, L. R.	42.63	5,290	206.07
McDavid, E.	10.00	270	4.17
McFarland, J. M.	66.50	10,465	392.29
Mackey, W. C.	202.50	11,410	623.99
Mattox, Maye	62.42	4,880	245.09
Miller, J. T. "B"	99.50	9,393	474.76
Minor, M. E.	120.00	8,295	388.13
Moore, W. P. "A"	50.00	7,120	242.78
Moore, W. P. "B"	61.30	10,680	402.16
Mullikin, W. A.	166.49	20,495	779.11
Neal, M. A.	22.00	430	100.79
Naulls, E. W.	74.94	3,615	201.63

DEFENDANTS' EXHIBIT No. 8

Humble Oil & Refining Company

East Texas Field

Lease	Acres	Potential	Allowable
O'Byrne, E. "B"	105.00	8,055	408.95
O'Byrne, E. "C"	10.00	350	21.69
O'Byrne, E. "D"	10.00	435	24.37
Peterson, Ben	53.00	1,610	174.50
Peterson, J. N.	223.10	42,425	1,565.39
Peterson, W. D.	97.75	3,365	351.80
Piercy, H. A.	140.70	19,540	868.72
Pilgreen "C"	139.40	9,585	467.22
Pitner, J. J.	64.80	9,155	330.72
Phillips, A. O.	82.74	6,235	317.04
Phillips, Jessie	77.60	8,525	380.60
Plowman, S. A. "A"	228.50	37,846	1,455.18
Plowman, S. A. "B"	14.46	3,270	124.50
Price, W. L.	446.50	47,875	2,037.69
Reid, V. E.	85.00	6,030	257.61
Reeves, M. H.	28.00	3,400	116.22
Robertson, J. T.	30.00	3,295	129.29
Robertson, M.	30.00	4,330	155.89
Robertson, O.	52.66	1,160	99.23
[fol. 709]			
Scott, A.	20.00	2,510	103.90
Sexton, H. "A"	91.70	14,573	600.86
Sexton, H. "B"	258.60	24,925	984.18
Sexton, H. "C"	84.40	14,319	512.72
Sexton, J. E. "A"	68.80	9,770	368.50
Sexton, J. E. "B"	64.90	6,730	238.19
Sexton, J. T. "A"	137.48	11,775	508.59
Shaw, W.	72.21	6,155	256.77
Shelton, A. L.	43.00	3,720	186.60
Sheppard, J. H. "A"	58.00	9,150	361.40
Sheppard, J. H. "B"	7.65	2,585	80.94
Shoults, W. C.	7.50	130	20.44
Silvey, J. H. "A"	165.00	19,925	760.46
Silvey, J. H. "B"	35.00	7,163	220.13
Silvey, R. E. L. "A"	468.07	49,682	2,126.23
Silvey, R. E. L. "C"	58.02	7,355	329.52
Simmons, A.	32.50	3,975	157.43
Smith, I. D.	222.00	29,415	1,181.05
Smith, E. W.	50.00	4,555	207.88
Smith, J. M.	90.30	7,446	360.24
Smith, M. "A"	27.00	1,010	65.31
Smith, M. "B"	25.00	1,120	66.71
Sneed, J. E. "B"	104.70	14,770	651.42
Thomas, Dura	59.07	9,175	495.32
Thompson, C. J.	116.00	21,020	839.90
Thompson, J.	80.90	11,617	394.03
Thompson, M. C.	110.00	9,115	354.81
Thrash, A.	12.00	2,515	112.31
Thrash, E. S.	42.04	5,680	243.73
Turner, J. W.	283.92	22,580	1,067.79
Turner, Neal	1.00	805	22.41
Turner, V. "A"	147.00	16,985	724.16
Turner, V. "B"	4.00	3,920	169.54
Walker, A. L.	128.50	17,475	656.36
Watkins, A. J.	81.30	6,890	362.50
Watkins, M.	10.00	360	22.32
Wells, Mary	69.50	6,230	300.05
Wheelis, J. E.	168.40	16,495	646.92
White, H. "A"	38.75	3,600	149.29

DEFENDANTS' EXHIBIT No. 8

Humble Oil & Refining Company
East Texas Field

White, H. "B"	132.96	8,175	398.21
White, J. R.	43.00	2,515	121.84
Williams, Joe	65.50	5,020	212.19
Willingham, G. W.	100.60	7,445	404.50
Wilcoxon, J. Mrs.	17.00	3,255	121.43
Wilson, A.	58.61	6,805	313.98
[fol. 710]			
Wilson, C. W.	96.90	6,005	293.57
Wooley, J.	300.00	12,250	423.96
Wooley, J. H.	201.50	32,870	1,194.25
Wooley, T. M.	55.00	7,640	304.40
Wooster, F. F.	61.30	7,710	315.87
Wooster, M.	74.23	7,175	308.80
Young, C.	23.00	4,315	164.34
Total Humble	14,578.72	1,841,224	76,593.71
East Texas Field	132,011.83	15,794,503	690,109.36
Humble's Percentage to Entire Field	11.04%	11.66%	11.10%

Endorsed: Nos. 31, 36 & 46 Civil Defendants' Exhibit No. 8. Filed 14th day of February, 1940. Maxey Hart, Clerk. By Joe Steiner, Deputy.

[fol. 711] DEFENDANTS' EXHIBIT No. 9

Table Showing Number of Wells Producing Salt Water in the East Texas Field Grouped in Five Per Cent Intervals

Per Cent of Total Salt Water Produced	Number of Wells
0% to 5%	789
5.1% to 10%	506
10.1% to 15%	320
15.1% to 20%	397
20.1% to 25%	212
25.1% to 30%	197
30.1% to 35%	212
35.1% to 40%	164
40.1% to 45%	109
45.1% to 50%	245
50.1% to 55%	70
55.1% to 60%	133
50.1% to 65%	105

Per Cent of Total Salt Water Produced	Number of Wells
[fol. 712] 65.1% to 70%	117
70.1% to 75%	107
75.1% to 80%	203
80.1% to 85%	96
85.1% to 90%	177
90.1% to 95%	181
95.1% to 100%	82
Total Wells Producing Salt Water	4,422

Endorsed: Nos. 31, 36 & 46 Civil Defendants' Exhibit No. 9. Filed 14th day of February, 1940. Maxey Hart, Clerk, by J. E. Davis, Deputy.

[fol. 713] DEFENDANTS' EXHIBIT No. 10

Tabulation Showing Varying Density to Which East Texas Field is Drilled

Acres	Barrels Assigned by Minimum	Wells	Per cent	Acres per Well	Cumulative Per cent	Average
109	7,200	360	1.40	.1 to .4		.3
374	10,460	523	2.03	.5 to .99	3.43	.71
2013	26,720	1336	5.19	1. to 1.9	8.62	1.5
5637	44,740	2237	8.66	2. to 2.9	17.28	2.5
30160	146,620	7331	28.45	3. to 4.9	45.73	4.1
57448	196,980	9849	38.22	5. to 6.9	83.95	5.85
37159	82,560	4128	16.05	7 and above	100.00	9.
132900		25764				

Endorsed: Nos. 31, 36 and 46 Civil. Filed 14th day of Feb., 1940. Maxey Hart, Clerk. (Signed) By Joe Steiner, Deputy.

[fol. 714] DEFENDANTS' EXHIBIT No. 15

Railroad Commission of Texas

Oil and Gas Division

Oil and Gas Docket No. 120

#6-795

In re: Conservation and Prevention of Waste of Crude Oil and Natural Gas in the East Texas Field

Austin, Texas, July 13, 1939.

Pursuant To previous notice and hearing in the adoption and amendment of rules and regulations by the Railroad

Commission of Texas governing the conservation of crude oil and natural gas and the prevention of waste thereof, and in the light of the evidence introduced at various hearings held by the Commission and particularly the hearing held in the City of Austin June 12, 1939, and in accordance with the findings of the Railroad Commission in its orders of August 26, 1935, September 3, 1937, and October 8, 1937, that the closer wells are drilled the greater will be the recovery from the area so drilled, and in view of certain allegations contained in the written petitions recently filed with the Commission by various owners of oil and gas leases in the East Texas Field;

It is Hereby Ordered by the Railroad Commission of Texas that Rule No. 1 of Sub-division II (Drilling) of Division 3, being special rules governing the East Texas Field, is hereby amended so that the same shall hereafter read as follows:

[fol. 715] Rule 1. Spacing Rule. No well for oil or gas shall hereafter be drilled in said East Texas Field nearer than 660 feet to any other completed or drilling wells on the same or adjacent tract or farm; and no well shall be drilled in said field nearer than 330 feet to any property line, lease line or subdivision line; provided that the Commission in order to prevent waste, or to prevent the confiscation of property will grant exceptions to permit drilling within shorter distances than above prescribed whenever the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property. When an exception to such rule is desired application therefor shall be filed with the Commission fully stating the facts, which application shall be accompanied by a plat drawn to the scale of one inch equalling four hundred (400) feet, accurately showing to scale the property on which permit is sought to drill a well under an exception to this rule, and accurately showing to scale all other completed, drilling and permitted wells on said property; and accurately showing to scale all adjacent surrounding properties and wells. Such application shall be verified by some person acquainted with the facts, stating that the facts therein stated are within the knowledge of the affiant true, and that the accompanying plat is accurately drawn to scale and correctly reflects all pertinent and required data. Such exception shall be granted only after at least ten (10)

days' notice to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard, and after the Commission has determined that an exception to such rule is necessary [fol. 716] either to prevent waste or to protect the property belonging to applicant from confiscation.

Provided Further That the Railroad Commission of Texas, in order to prevent waste or to prevent the confiscation of property, may upon its own motion or order, issue or grant a permit or permits for the drilling of any well or wells for oil or gas nearer than 660 feet to any other completed or drilling well on the same or adjacent tract of land or farm and nearer than 330 feet to any property line, lease line or subdivision line as hereinbefore prescribed whenever the Commission shall determine that the drilling of any such well or wells is necessary to prevent waste or to prevent the confiscation of property. When in the opinion or judgment of the Commission waste or confiscation of property is reasonably eminent or is taking place on any leasehold, the Commission may, on its own initiative or motion, order a hearing for the purpose of determining whether such waste or confiscation of property is taking place. Such permit or permits shall be issued or granted only after at least ten (10) days' notice to the owners of said leasehold and to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard and after the Commission has determined that the drilling of any well or wells for oil or gas is necessary either to prevent waste or to protect the owners of said leasehold from confiscation. [fol. 717] No well drilled in violation of this rule without special permit obtained issued or granted in the manner prescribed in said rule, and no well drilled under such a special permit or on the Commission's own order which does not conform in all respects to the terms of such permit, shall be permitted to produce either oil or gas; and any such well so drilled in violation of said rule or in violation of a permit granted as a special exception to said rule or on the Commission's own order shall be plugged.

The order entered by this Commission on August 30, 1933, commonly designated as the direct and equidistant offset order is hereby rescinded, annulled and shall be of no further force and effect. All other rules, regulations and or-

ders of this Commission which conflict with the terms and provisions of Rule No. 1 as hereby amended and promulgated are hereby declared to have no further application to wells in said East Texas Field to the extent of such conflict.

In the adoption and promulgation of this order, it is here declared that the Commission intends to adopt each phrase, sentence, and paragraph separately and independently of each other such phrase, sentence, and paragraph, and if any portion of this order or any portion of the rule hereby adopted shall be declared invalid, such declaration and such invalidity shall not affect any other portion.

Railroad Commission of Texas, Lon A. Smith, Chairman; Jerry Sadler, Commissioner. (Seal.)

Attest: C. F. Petet, Secretary.

[fol. 718] STATE OF TEXAS,
County of Travis:

I, C. F. Petet, Secretary to the Railroad Commission of Texas, do hereby certify that the attached order of the Railroad Commission of Texas described as follows:

Order of Railroad Commission of Texas dated July 13th, 1939, in re: Conservation and prevention of waste of crude oil and natural gas in the East Texas Field,

is a true and correct copy of the original order as shown by the records in that office, and in my custody as secretary and Custodian of the files of said Railroad Commission of Texas.

Witness, my hand and the seal of the Railroad Commission of Texas, this the 2nd day of August, 1939, A. D.

(Signed) C. F. Petet, Secretary.

[fol. 719] DEFENDANTS' EXHIBIT No. 16

Railroad Commission of Texas, Oil and Gas Division

Oil and Gas Dockets Nos. 108, 120, 123, 124, 125, 126, 128, 129, 132, and 146

In re: Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Texas

Austin, Texas,
August 26, 1935.

Special Order Fixing Allowable Production of Crude Oil in the Various Fields and Districts in Texas

Whereas, after due notice hearings have been held at Austin, Texas, at various times, including hearing on August 19, 1935, with respect to the existence and imminence of waste of oil and gas in the State of Texas, and the prevention thereof; and,

Whereas, in view of the evidence, including among other matters the physical conditions in the various fields, the transportation and marketing facilities, the reasonable market demand, the reasonableness of the allocation as between fields of the allowable production under previous orders; and,

Whereas, the Railroad Commission of Texas finds from the evidence that the reasonable market demand for oil produced in this State from the various fields and districts therein equals the amount hereinafter shown as the allowable production thereof during the period beginning at 7 o'clock, A. M., September 1, 1935, and ending at 7 o'clock, A. M., October 1, 1935; and,

Whereas, the Railroad Commission of Texas finds that waste exists or is imminent and that to prevent such waste of oil and gas, as the same is defined by the applicable statutes, it is necessary to restrict the production of oil in the [fol. 720] State of Texas as provided for herein:

Whereas, at the hearing of the Railroad Commission of Texas on August 19th, 20th, 26th, and 27th, 1935, the Railroad Commission of Texas heard at great length the proposal as outlined by the witness F. E. Heath, who testified on behalf of the Humble Oil & Refining Company, The Texas

Company, the Shell Company, the Sun Oil Company, the Tidewater Company, Magnolia Petroleum Company and the Amerada Company, whose formula would put the East Texas Field on a plan of acreage proration, which plan was acreage times potential with a ten acre spacing rule, which works out as follows:

Under certain conditions, the owner of a ten acre tract in the East Texas Field with one well on this tract would be allowed 29 barrels of allowable production of petroleum each day, and the owner of a tract of one acre with one well on it, under the same conditions, would be allowed to produce 2.9 barrels of oil per day. This plan was later extended by the proponents to the extent that it was recommended that the Commission make exceptions so that the man with a well on one acre would be allowed substantially eight barrels of oil per day or enough oil to bring $8.00 per day, or some such amount, in the discretion of the Commission, which would allow the small operator to make a profit out of his operation.

The Commission, after an exhaustive hearing on this matter, finds that the present method of proration in effect in the East Texas Field at this time, which is to allow the well to produce that amount below set out, which is three per cent of the average hourly potential producing capacity [fol. 721] of each well, as determined by the Commission, is the fairest method possible.

The Commission further finds that this method of proration prevents waste, conserves the oil and gas within the East Texas Field, and does not result in injury to any lease operator or owner in said field.

In the recent case of Brown v. Humble Oil & Refining Company, the Supreme Court announced certain rules for our guidance in enforcing the provisions of Rule 37. We recognize the authority of that Court to construe the laws under which we function, as well as its authority to review orders pursuant to statute or under the circumstances outlined in that opinion, and it is not only our duty but our desire and intention to comply with its decrees. However, in this instance, the importance of its decision to this boy, the public and the industry is so great that we must undertake to be certain, both of our understanding of the scope of the judgment and of its finality.

As an administrative body, our temporary difficulty arises out of certain expressions in the opinion, founded on fact issued, which are not consonent with the evidence presented to this Commission over a period of years on the same essential facts as presented at this and prior hearings held by this Commission. If such expressions are limited to facts necessary to a decision of that case, they present no confusion, but, if they are intended to form a rule of property for our guidance in all cases, then it appears to us that the importance of the question merits clarification.

In the opinion referred to, the Court observes, "It is now, however, recognized that when an oil field has been fairly [fol. 722] tested and developed, experts can determine approximately the amount of oil and gas in place in a common pool, and can, also, equitably determine the amount of oil and gas recoverable by the owner of each tract of land under certain operating conditions."

Based upon this finding, the Court then defines our duties in the following language, in part:

"Also conditions may arise where it would be proper, right and just to merit tracts to be sub-divided, and such sub-divisions drilled after the adoption of the rule but in all such instances it is the duty of the Commission to adjust the allowable, based upon the potential production, so as to give the owner of such smaller tract only his just proportion of the oil and gas. By this method each person will be entitled to recover a quantity of oil and gas substantially equivalent in amount to the recoverable oil and gas under his land."

Our uncertainty arises out of the fact that, in the exercise of our duties at hearings held over a number of years, a substantially preponderant majority of the expert witnesses have testified under oath to facts which do not harmonize with but contradict the statement that "when an oil field has been fairly tested and developed, experts can determine approximately the amount of oil and gas in place in a common pool and can, also equitably determine the amount of oil and gas recoverable by the owner of each tract of land under certain operating conditions". In fact, the testimony we have heard at this and other hearings held in the past is to the effect that surface ownership has no

true relation to the oil and gas reserves which may underlie [fol. 723] the particular surface, and that sufficient information is not available in the state of engineering science today to determine with that degree of exactitude indicated by the quotation from the opinion the amount of oil and gas in place in a common pool * * * to equitably determine the amount of oil and gas recoverable by the owner of each tract under certain operating conditions.

We further find from the evidence the more wells that are drilled the greater will be the ultimate recovery of oil and gas from any given pool.

The hearing just closed raises grave doubts as to the wisdom or value of any Rule 37 in preventing waste or in aid of the recovery of oil, except in the instances of certain new fields and then only as a prevention of fire hazards and blowout dangers.

Now, Therefore, in order to prevent the waste of oil and gas in the State of Texas, which will take place by authorizing production over the said period in excess of the reasonable market demand:

It is Hereby Ordered that beginning at 7 o'clock A. M., Sunday, September 1, 1935, and continuing to October 1, 1935, unless other periods are prescribed herein, the production of oil in the State of Texas, and the various fields therein, until further ordered, shall not exceed the amounts hereinafter shown as the allowable production thereof, and in order to adjust the current allowable production of crude oil in Texas, as nearly as may be, to the demand as shown, the allowable daily production of the various fields and districts in said State shall be limited to the amounts here- [fol. 724] inafter specified and the following orders fixing such limitation on production in the various fields and districts are hereby adopted.

1. Rule 2 of Division 2 as contained in an order of this Commission dated October 17, 1933, pertaining to the Panhandle District of Texas is hereby readopted and amended as follows:

Rule 2. Not more than fifty-two thousand eight hundred (52,800) barrels of crude oil shall be produced from said district during any day of the effective period of this order. Moore County shall not produce in excess of fifteen hundred

(1500) barrels per day. Moore County allowable is additional to Panhandle allowable.

2. Rule 23 (a) of Division 3, as contained in an order of this Commission dated October 17, 1933, pertaining to the East Texas Field is hereby readopted and amended as follows:

Rule 23 (a). It is ordered that during each twenty-four (24) hour period beginning at 7 A. M., Central Standard Time, September 1, 1935, the owner or operator or manager of each well in the East Texas Field, shall be permitted, either collectively or individually, to produce daily from each well a maximum of Three (3%) per cent of its average hourly potential production capacity as determined by the Commission.

3. Rule 2 of Division 5, as contained in an order of this Commission dated October 17, 1933, pertaining to the North Texas District is hereby readopted and amended as follows:

[fol. 725] Rule 2. Not more than fifty-eig*th* thousand five hundred (58,500) barrels crude oil shall be produced from said district during any day of the effective period of this order. Foard County shall not produce in excess of eight hundred thirty-seven (837) barrels per day. Foard County allowable is additional to North Texas allowable.

4. Rule 2 of Division 6, as contained in an order of this Commission dated October 17, 1933, pertaining to the West Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than forty-nine thousand one hundred ninety-five (49,195) barrels of crude oil shall be produced from said District during any day of the effective period of this order, which is distributed to the various counties as follows:

Brown	2006	Fisher	5,331	Shackelford	5873
Callahan	1631	Haskell	17	Stephens	5080
Coleman	1310	Irion	56	Throckmorton	483
Comanche	84	Jones	2,098	Taylor	130
Crockett (Todd)	10	McCullough	1	Upton(McCamey)	5920
Crockett (World)	835	Palo Pinto	447	Young (S/2)	4079
Eastland	3191	Reagan (Big Lake)	9,800	Runnels	520
Erath	113	Reagan (Grayson)	180		

5. Rule 4 of Division 7, as contained in an order of this Commission dated October 17, 1933, pertaining to the West Texas District is hereby readopted and amended as follows:

Rule 4. Not more than one hundred thirty thousand one hundred twenty (130,120) barrels of crude oil per day shall be produced from said District during any day of the effective period of this order, which shall be distributed to the various fields therein as follows:

[fol. 726]

Brown & Altman	212	Iatan-E. Howard	4,000	Sealey	66
Church & Fiels	5830	Johnson	35	Shipley	1580
Cowden, North	3270	Keystone	350	Taylor-Link	1165
Cowden, South	580	Leck	500	Tobarg	1750
Crane-Dowden	372	Loving (Wheat)	1,986	Ward, North	5650
Crane-Waddell	313	Masterson	250	Ward, South	9800
Depp Rock	239	McClintic	500	Westbrook	919
Edwards	4	Netterville	9	Walker	12
Ector-Harper	125	Monroe	25	White & Baker	2
Ector-Penn	5088	Means	605	Yates	39,124
Fuhrmans	900	Parker	119	Goldsmith	375
Gulf-McElroy	3865	Pecos Valley	225	Sand Hills	15
Sayre	1650	Richards	12		
Hendricks	16,150	Halley	100		
Howard-Glasscock	20,000	Northwest	23		
		Scarbrough	2325		

6. Rule 2 of Division 4, as contained in an order of this Commission dated October 17, 1933, pertaining to the East Central Texas District is hereby readopted and amended as follows:

Rule 2. Not more than forty seven thousand eight hundred thirty-six (47,856) barrels of crude oil per day shall be produced from said fields in said District during any day of the period of September 1, 1935, to October 1, 1935, said amounts shall be allocated to the varions fields in the following amounts:

Boggy Creek	572	Mexia	2145	South Bosque	12
Camp Hill	651	Post Oak	2	Van	35,733
Cayuga	3720	Pottsboro	6	Van Shallow	215
Curry	148	Rusk	450	Trinity	1,174
Corsicana	415	Richland	35	Wortham	102
Long Lake	200	Powell	2244	Wortham Shallow	12

7. Rule 2 of Division 8, as contained in an order of this Commission dated October 17, 1933, pertaining to the Southwest Texas District is hereby readopted and amended as follows:

Rule 2. Not more than ninety-five thousand nine hundred nine (95,909) barrels of crude oil shall be produced in said

District during any day of the effective period of this order, and the same shall be distributed to all fields in said district as follows:

[fol. 727]

Division 1.					
Alta Vista	5	Dunlap	15	Matthews	59
Bateman	247	Eckert	271	Meaders	6
Bob Rose	73	Espada Mission	1	Minerva Rockdale	203
Buchanan	41	Gas Ridge	7	Noach	731
Callahan	48	Hilbig	722	Pearsall	(Shut in)
Carroll	84	Jones	1	Schimmel-Batts	1
Cedar Creek	42	Jacobs	595	Somerset	733
Cedar Creek (N)	200	Kimbro	22	Southton	72
Chapman-Abbott	396	Larremore	40	Taylor Ina	12
Chicon Lake	13	Loma Alto	132	Thrall	53
Clark	100	Lowe	1	Salt Flat	4112
Cooksey	16	Luling-Branyon	5637	Von Ormy	39
Darst Creek	8932	Lytton-Springs	396	Yoast	75
Dale	165	Manford	36		
Division 2.					
Caesar	950	Normanna	15	Refugio (Deep Sand)	195
Coletta Creek	660	O'Connor-McFadden	350	Refugio (New)	1305
Dinero	240	Placedo	470	Refugio (Old)	2800
Dirks	1900	Pettus	1661	Hords Creek	2
Greta	11,830	Pettus (New)	870	Tuleta	2527
Keeran	320	Port Lavaca	600	Vanderbilt	100
McFadden	130	Quintanna-O'Connor	1600	Worthington	200
McNeil	500	Ray	950	Mekeska	150
Mineral	10			Maurtiz	150
Mt. Lucas	210				
Division 4.					
Albercas	111	Gov't Wells (S)	5,789	O'Hern	920
Alworth	3	Guerra	372	Piedras Pintas	45
Angelita	3	Henne-Winch-Farris	26	Plymouth	1800
Aviators	409	Jennings	555	Premont Prospect	20
Barbacosa	38	Kingsville	61	Randado	334
Bruni	2,975	Kohler	132	Rio Grande City	384
Carolina-Tex	23	Laurel	95	Roma	4
Charco Redondo	9	Loma Novia	2520	Sinton	594
Cole East	37	Lopez	450	Seven Sisters	320
Cole West	753	Los Olmos	200	S. R. C.	40
Cuellar	113	Mercedes	150	White Point	38
Driscoll	249	Mirando City	389	Sam Fordyce	3126
Eagle Hill	471	Mirando Valley	25	Sarnosa	940
Escobas	1396	Moca	614	Saxet (Old)	1262
Gov't Wells (N)	11,233			Saxet (New)	1849

8. Rule 2 of Section A, Division 8, as contained in an order of this Commission dated October 17, 1933, pertaining to the Gulf Coast District is hereby readopted and amended as follows:

Rule 2. Not more than one hundred forty-seven thousand three hundred forty-eight (147,348) barrels of crude oil per [fol. 728] day shall be produced from said fields of said district during any day of the effective period of this order which shall be distributed to said fields as follows:

Allen Dome	5	Gillock	(Shut in)	Orchard	600
Anahuac	900	High Island	6170	Orange	741
Ariola	1150	Hankamer	1858	Pickett Ridge	150
Bay City	35	Hankamer (New)	350	Port Neches	1488
Big Creek	931	Hardin	150	Pierce Junction	2790
Blue Ridge	1013	Hastings	1800	Pierce Junction (Vicksburg)	583
Boling	605	Hull (Old)	3583	Raccoon Bend	2883
Brenham	6	Hull (New)	2961	Raccoon Bend (Cockfield)	1581
Brookshire	16	Humble	3255	Rockland	3
Buckeye	220	Lost Lake	230	Saratoga	850
Batson	690	Louise	1241	Schwab	56
Batson (New)	621	Livingston	2666	Sugarland	5580
Barbers Hill	17,205	Manvel (Miocene)	4000	Sour Lake	1755
Clay Creek	1,049	Manvel (Oligocene)	3500	South Liberty	586
Cleveland	775	Markham	1349	Spindletop	2597
Conroe	39,525	Mykawa	775	Thompson	10,737
Damon Mound	521	Mykawa (New)	2100	Tomball	4,650
Dickinson	964	Nash Dome	35	West Columbia	2,321
Esperson Dome	1200	North Dayton	162		
Fannett	964	Old Ocean	200		
Goose Creek	2857				

It is Further Ordered that allowable oil in the foregoing order is oil measured on 100 per cent tank tables according to the Pipe Line Rule Number Nine (9) and corrected to sixty (60) degrees Fahrenheit.

It is Further Ordered that this Cause be held open on the docket for such further orders as may be necessary and supported by evidence of record in above Cause.

Railroad Commission of Texas, Ernest O. Thompson, Chairman; C. V. Terrell, Commissioner; Lon A. Smith, Commissioner.

Attest: C. F. Petet, Secretary. (Seal.)

/jhi.

[fol. 729] I, C. F. Petet, Secretary of the Railroad Commission of Texas, do hereby certify that the attached instrument, being a mimeographed copy of the Commission's Order entitled "Special Order Fixing Allowable Production of crude Oil in the Various Fields and Districts in Texas" dated August 26, 1935, is a true and correct copy of the original now on file in these offices and in my custody as Secretary of said Commission.

Witness My Hand and the Seal of the Railroad Commission of Texas This the 11th day of October, 1939.

(Signed) C. F. Petet, Secretary of the Railroad Commission of Texas.

Endorsed: Nos. 31, 36 & 46 Civil. Defendants' Exhibit 16. Filed 16th day of February, 1940. Maxey Hart, Clerk, by J. E. Davis, Deputy.

[File endorsement omitted.]

[fol. 730] In United States District Court, Western District of Texas, Austin Division

Opinion of the Court After Trial on the Merits—February 21, 1940

No. 31 Civil

Humble Oil & Refining Co.

v.

Railroad Commission of Texas, et al.

Attorneys for Plaintiff: Rex G. Baker, E. E. Townes, R. E. Seagler, Felix A. Raymer, Carl Illig, Jr., R. E. Hardwicke, Powell, Rauhut & Gideon.

Attorneys for Defendants: Gerald C. Mann, Attorney General of Texas, James P. Hart, D. D. Mahon, E. R. Simmons, Tom D. Rowell, Jr., Edgar Cale, and Lee Shoptaw, Assistant Attorney Generals.

No. 36 Civil

F. W. Fischer

v.

Lon A. Smith, et al.

Attorneys for Plaintiff: F. W. Fischer, W. T. Saye.

Attorneys for Defendants: Gerald C. Mann, Attorney General of Texas, James P. Hart, D. D. Mahon, E. R. Simmons, Tom D. Rowell, Jr., Edgar Cale, and Lee Shoptaw, Assistant Attorney Generals.

No. 46 Civil

Rowan & Nichols Oil Co.

v.

Railroad Commission of Texas, et al.

Attorneys for Plaintiff: Dan Moody, Rice M. Tilley.

Attorneys for Defendants: Gerald C. Mann, Attorney General of Texas, James P. Hart, D. D. Mahon, E. R. Simmons, Tom D. Rowell, Jr., Edgar Cale, and Lee Shoptaw, Assistant Attorney Generals.

[fol. 731] Judge Sibley: Are counsel present in the oil cases? They don't have to be.

Mr. Baker: Yes, sir, I am here for the Humble.

Mr. Cale: The Railroad Commission is represented. I don't believe Mr. Fischer has a representative here. I don't know.

Judge Sibley: He wouldn't have to be, of course. We are about, gentlemen, to announce our conclusions in a general way in these cases. The paper I am about — read is not final. It is in the nature of conclusions of law, but we reserve the right to modify or change them to meet more exactly our views, to express more exactly what we think the law is, if it becomes necessary, but for the present purposes, I read these conclusions, disposing of the cases.

First, the Court has jurisdiction in each case.

Second, in the case of F. W. Fischer, an injunction, either temporary or permanent, ought not to be granted, because no irreparable injury is shown to him by the operation of the order. It does not operate unreasonably as to him.

We find, as will appear, that the situation is otherwise as to the other litigants. We think that the present injury to each of them is clear, practically admitted, and the only reply to it is that in the future the injury under this order may be returned to them. We regard that contingency as so uncertain as to make it our duty to look principally to the present operation, and to say that they have established such an injury in its nature irreparable, and without any other remedy at law as to make it our duty to examine the order.

That part of the order which fixes the top allowable made to prevent waste, the Commission had power to make, and it is not arbitrary or unreasonable. The statute which declares that pumping wells of the depth that all wells have [fol. 732] in the East Texas oil field and which can produce no more than twenty barrels per day in thirty consecutive days are "marginal wells", and not to be restricted by the Commission, is not patently invalid. These wells are almost wholly on the edges of the field and are approaching exhaustion. The Legislature could make of them a separate class, and in view of the expense of operating them by pumping and of their probable short life the fixed allowable granted them is probably not arbitrarily fixed. The amount

of the present top allowable to them is less than one per cent, and the effect of it on the fairway wells which are here complaining is too uncertain and insignificant to require a decision on the constitutionality of the statutory classification.

The portion of the order which prorates the remainder of the top allowable among the non-marginal leases and wells so operates that about three-fourths of it is distributed on a flat basis per well so as to give each well an initial twenty barrels per day, but with three days of shut down each week, it makes an equivalent of about 11.7 barrels per day. The remaining one-fourth is prorated by a formula which takes account of the productive capacity or potential of each well, and the acreage, sand thickness, and bottom hole pressure of each lease, all as factors in fixing the allowable for the wells on the lease. This operates to restrict more drastically the production from the best wells and leases in the fairway, where all those of Rowan & Nichols Company are and most of those of Humble Oil Company, than that from less productive wells to the east and west, and that from more densely drilled leases in the fairway. Is this result so unreasonable as to make the order contrary to the statute or the Fourteenth Amendment?

The question under the two seems to be approximately the same. If the proration is unreasonable, the statute [fol. 733] doesn't give the Commission authority to make it. If it is so unreasonable as to be arbitrary, the Constitution does not permit it to be done either by the Legislature or the Commission.

The Commission as to all wells at first made a straight per well proration. The Commission's orders of this sort were held unreasonable. A later order which combined well potential with a flat per well allowance so that about half of the total was distributed according to potential was upheld as reasonable. It is not now urged that no basic flat per well allowable should be made, but only that three-fourths of the whole should not reasonably be so apportioned. The reason for distributing three-fourths of the allowable on a flat basis per well, or for distributing any of it on that basis, is not precisely disclosed. As in the case of marginal wells, it seems to be thought necessary in order to keep the poorer wells, especially those having to be pumped, going at all. If they were forced out, the oil they would produce might in fact never be produced, causing

waste; or shut down might be a deprivation of their owners' property contrary to the Constitution. The evidence here, however, is that even with a pumping well production can be profitably continued on five to ten barrels per day. We can think of no reason why a higher allowable per day should be fixed for non-marginal wells when to do so makes three-fourths of the distributable oil go neither according to the productive capacity of the wells nor according to the oil belonging to the several leases. That the Legislature fixed a figure of twenty barrels for marginal wells is without great significance, for they are perishing wells. Others which are near the border line will soon enough enter that class, and need not prematurely be treated as such. The drilling density of wells is so diverse on different leases otherwise comparable that to distribute three-fourths of a top allowable on a flat basis per well without reference to [fol. 734] the oil reserves of the lease or the productive capacity of those wells, which constitute the value of the property, is unreasonable and therefore in violation of the Constitution and the statute. It is not for us to suggest a proportion or a formula. We think the present proportion unsustainable.

We do not say that the time element, the probable life of the wells, may not be considered in an apportionment, though there is necessarily much uncertainty involved. We do not say that either presently or ultimately each lease must be allowed to produce in exact proportion either to its present or original oil in place. All of these may be given a reasonable consideration, sacrificing property interests as little as may be in the effort to achieve the public aim of conservation. Some inequalities attend all legal regulation, and must be borne, but the regulation itself must be on a fair principle and founded on good reason. Previous decisions have established a flat per well apportionment to be unreasonable, and also one which was substantially that, though some effect was given to well potential. We now hold that with the wide differences in well density and in well capacity that exists in the East Texas field, an apportionment of three-fourths on a flat per well basis is not justified by a good reason,—is unreasonable.

As the conclusion from this holding, we will deny the temporary injunction to the Rowan & Nichols Company for the reason that one was denied in respect to the Humble Company, and we think it best to let matters go along on

an even keel with no differences in the oil field. Permanent injunctions will be granted both to the Rowan & Nichols Company and to the Humble Company, but we do not wish to enter the injunctive decrees and upset the oil field until [fol. 735] an opportunity has been given to decide the future of this case. For that reason, for the period necessary to make a determination, about which we will hear you gentlemen, we desire that a decision be reached as to whether or not an appeal is to be taken, or whether the decision will be submitted to on the part of the Railroad Commission.

If it is to be submitted to, they probably would desire time to make a new order, in order to avoid upsetting the operations in the field. If it is to be appealed, we would, of course, have to enter the final decrees that they might be appealed from, but the effect of it could be controlled by orders or supersedeas of the proper sort. So that is the practical situation that we wish to handle. If there is an appeal, of course, findings of fact in which we would want the assistance of counsel would have to be prepared, and perhaps more exact or more elaborate findings of law, conclusions of law, but this states our decision of the case.

If the Commission or its representative could indicate to us what time they would like to consider the future course of matters, we would be glad, of course, to understand what that time is, and fix it. We will have to separate, but we would be glad to take care of it by mail.

Mr. Cale: May it please the Court, I would like some hour or so to confer with the Railroad Commissioners on their desire in the matter. At this point I can't definitely tell the Court what position they will take. I presume they will pursue the course of an appeal, but in the event that is not their desire in the matter, I would like to have some time to discuss it with them and report back to the Court.

Judge Sibley: That is an entirely reasonable time.

Mr. Baker: I want to be sure, if the Court please, that I understand. I assume that the Court had in mind that the [fol. 736] Commission would be given a reasonable time to make an order that would remedy the situation, or at least do away with this order which the Court has held to be unreasonable.

Judge Sibley: If they wish to, we will consider that.

Mr. Baker: Yes, sir.

Judge Sibley: But they say for the present they want to decide whether they are going to appeal.

Mr. Cale: That is correct. I would like to have an opportunity to confer with the Commission and see what their wishes are and report back some time this afternoon or after lunch at the Court's pleasure.

Mr. Baker: If the Commission should——

Judge Sibley: We don't want to rush you to an hour.

Judge Allred: We don't want to limit the conference with the Commission, as to whether you will appeal or not. You can confer with them about whether they will call a hearing and perhaps pass another order. We will give you all of the time you need.

Judge Sibley: You can have all of the time you need to keep your business straight. That is the purpose of our question.

Mr. Cale: Yes, sir. We would like to have as much time in that regard as the Court will give us. We would like to cooperate with the Court as much as we can.

Judge Sibley: I think a week or ten days, if you want to consider the situation and arrive at a fixed conclusion that will be reasonable and right.

Mr. Cale: I understand the order will not be entered?

Judge Sibley: There will be no order entered at all within that time.

Mr. Cale: All right, thank you, sir.

Judge Allred: And, Judge, pardon me. I think the Commission would be entitled to this indication. If the Commission decides to hold a hearing—give notice and hold a [fol. 737] hearing, with the idea in mind to prepare another order, we would be willing to extend that time.

Judge Sibley: I think so.

Judge Allred: They have to give ten days notice under the statute, if they want to do that.

Mr. Cale: Yes, sir, that is correct.

Judge Sibley: I really had in mind to give thirty days for a purpose of that sort.

Mr. Cale: We would appreciate having that time, Your Honor. I didn't know what the court's disposition would be in regard to that matter. If you could give us thirty days——

Judge Allred: I think Judge Sibley meant we would give you ten days for the Commission to decide what they wanted to do, and if they wanted further time to give notice and have a hearing, we would be willing to give you thirty days,

so as to give time to give that notice, as required. That is my understanding. That was your understanding, wasn't it, Judge?

Judge Sibley: Yes.

Mr. Cale: Thank you, sir.

Judge Sibley: We will not hold the Pullman Company lawyers in attendance. We will have to decide that case a little more at our leisure. We can't decide it instantly, and we will file a decision when we reach it.

Mr. Moody: May I ask a question? All of the questions or exceptions and matters of that kind, I suppose, will be taken care of when the order is finally entered?

Judge Sibley: You don't need any exceptions now. They are obsolete.

Mr. Moody: Well, I wasn't sure about the new practice.

Judge Sibley: Well, we will take a recess. We will take a recess until two o'clock.

* * * * * * *

[fol. 738] Reporter's Certificate to foregoing paper omitted in printing.

Endorsed: Opinion of the Court after Trial on the merits. Filed 9th day of April, 1940. Maxey Hart, Clerk, by Joe Steiner, Deputy.

[fol. 739] IN UNITED STATES DISTRICT COURT, WESTERN DISTRICT OF TEXAS, AUSTIN DIVISION

No. 46 Civil Action

ROWAN & NICHOLS OIL COMPANY,

vs.

RAILROAD COMMISSION OF TEXAS

JUDGMENT—Filed May 29, 1940

The above entitled and numbered suit came on for trial at Austin, in the Austin Division of the Western District of Texas, on February 13, 1940, before S. H. Sibley, Judge of the United States Circuit Court of Appeals for the Fifth Circuit, James V. Allred, Judge of the United States Dis-

trict Court for the Southern District of Texas, and R. J. McMillan, Judge of the United States District Court for the Western District of Texas, said Court having been ordered and organized pursuant to Section 380, Title 28, of the Judicial Code to hear and determine Plaintiff's application for an interlocutory injunction, when Plaintiff appeared by its counsel and announced ready for trial, and the Defendants also appeared by their counsel and announced ready for trial.

Whereupon, the Court heard the pleadings and the suit proceeded on trial from day to day until February 16, 1940, when introduction of testimony was concluded, and Plaintiff, while continuing to press its application for temporary injunction, then offered also to submit the suit for final decision on its merits upon the record made in the hearing of the application for temporary injunction; and the Defendants consented that the suit be decided on its merits upon the record made on the hearing of the application for temporary injunction; thereupon, the Court heard argument of counsel, and upon conclusion of arguments, the Court took the suit under advisement, and on February 21, 1940, in open court, announced it to be the decision, judg-
[fol. 740] ment, and opinion of the Court that the law and the facts were with Plaintiff, and that the orders of the Railroad Commission of Texas prorating oil production in the East Texas field, and more particularly the proration orders of date December 20, 1939, as amended, renewed and extended by the orders of January 24, 1940, allocating among wells in said field the daily field allowable, are unreasonable and void as to Plaintiff, and as construed, applied and enforced to control production from Plaintiff's wells, deprive Plaintiff of its property, contrary to the statutes of the State of Texas and in violation of the due process and equal protection clauses of the Fourteenth Amendment to the Constitution of the United States, and inflict upon Plaintiff daily and currently irreparable injury, for which Plaintiff has no adequate remedy at law; and the Court being of the further opinion that Plaintiff will hereafter daily and currently suffer irreparable injury, for which it has no adequate remedy at law, all contrary to the statutes of Texas and to the Fourteenth Amendment, as aforesaid, if said orders, or orders which are the same or substantially the same as the orders complained of, are enforced against Plaintiff's property and wells in the East Texas field, and

especially to restrict production of oil by Plaintiff from its seven wells on its Todd "A" lease of 28.25 acres in the William H. Castleberry League, Gregg County, Texas; at the same time, the Court announced that Plaintiff's application for interlocutory injunction would be denied, but that Plaintiff would be granted a permanent injunction; and at the same time the Court announced that the injunction order would not be entered for ten days, in order to allow the Defendants an opportunity to determine whether they desired to appeal, or for even longer, if Defendants desired to give notice, conduct a hearing, and promulgate a new and valid order; and Defendants having now announced [fol. 741] that they do not elect to issue a new order, but desire to perfect an appeal, the Court is of the opinion that a permanent injunction, enjoining the Defendants from enforcing said orders as to Plaintiff and its said property, should be granted and the decree entered:

It is Therefore Ordered, Adjudged and Decreed by the Court that the orders of the Railroad Commission of Texas of December 20, 1939, as amended, extended and renewed, by the orders of January 24, 1940, fixing and allocating among wells in the East Texas field the daily allowable for said field, which said orders are more particularly described in Plaintiff's pleadings, are null and void as to Plaintiff and its said property, and the Railroad Commission of Texas, Lon A. Smith, Ernest O. Thompson and Jerry (G. A.) Sadler, members of said Commission, and Gerald C. Mann, Attorney General of Texas, individually and officially, and their successors, representatives, agents, servants, attorneys and employees, be and they are each and all hereby permanently enjoined from enforcing or attempting to enforce against Plaintiff and its said property the above described and mentioned proration orders and the schedules issued in connection therewith, as well as any and all other proration orders, rules, regulations and schedules which have been or may be promulgated by the Railroad Commission of Texas for the East Texas field in renewal or extension of said orders and schedules, or which are the same or substantially the same, or have substantially the same effect as said orders and schedules of December 20, 1939, and January 24, 1940, as the same have been construed, enforced and applied to control production from Plaintiff's said property.

It is further Ordered, Adjudged and Decreed that the

Defendants and each of them, their successors, representatives, agents, servants, attorneys and employees, are hereby [fol. 742] permanently enjoined from denying to Plaintiff tenders to move, or from interfering in any way with the transportation and marketing of, the oil produced or to be produced in accordance with this judgment, and from suing for or from attempting otherwise to claim or collect penalties or to enforce forfeitures or in any other manner to penalize the oil or Plaintiff, on account of the oil produced or to be produced in accordance with this judgment.

This decree is entered, however, without prejudice to the right of said Defendants to enter a reasonable proration order and to fairly enforce it against Plaintiff.

All costs in this suit are taxed against Defendants.

The Clerk is directed to enter this judgment.

To which action, order, and judgment of the Court, the Defendants, in open Court, duly excepted.

Defendants having declared in open court that they would prosecute an appeal from this judgment, enforcement of the injunction herein granted is stayed for a period of sixty days from the date hereof.

Entered at Austin, Texas, this the 28th day of May, A. D. 1940.

(S.) Saml H. Sibley, Judge, United States Circuit Court of Appeals, Fifth Circuit. (S.) James V. Allred, Judge, United States District Court for the Southern District of Texas. (S.) Robert J. McMillan, Judge, United States District Court for the Western District of Texas.

Entered: Civ. O. B., Vol. 1, page 99.

[File endorsement omitted.]

[fol. 743] IN UNITED STATES DISTRICT COURT

[Title omitted]

FINDINGS OF FACT AND CONCLUSIONS OF LAW—Filed May 29, 1940

As required by Rule 52 (a) of the Federal Rules of Civil Procedure, the court of three judges (consisting of Sibley, Circuit Judge, and McMillan and Allred, District

Judges) makes the following as its findings of fact and conclusions of law in the above numbered and entitled action, and the court directs that the Clerk of this Court file such findings and conclusions of law as part of the record in this action.

A

Findings of Fact

1. The allegations of plaintiff in reference to parties, jurisdiction, and the import of the orders attacked are not denied, and have been sustained by proof and admissions.

2. The East Texas field is one huge reservoir embracing originally some 133,000 acres of land and at present including some 131,330 to 131,800 acres of land situated in Rusk, Gregg, Smith, Cherokee and Upshur Counties, Texas; the field is approximately 40 miles long north and south, and has an average width of about 4 miles east and west. The reservoir is in the Woodbine sand at an average depth of some 3,650 feet below the surface. In it the oil is confined by an impervious formation (Austin chalk) above, and an impervious formation (Georgetown lime) and water below. A cross section of the field extending from west to east has the shape of a vast obtuse-angled [fol. 744] triangle. One of the short sides (the westward side or base) of the triangle is a line in the plane of oil-water contact. The other short side of the triangle is a line in the plane of the Georgetown lime, a formation extending eastward and upward. The angle formed by these to lines of the cross section is the obtuse angle of the triangle, and is the lower angle of the three. The long or top side of the triangle is in the plane of the Austin chalk and extends from the point of contact between the oil, the water and Austin chalk on the west side of the structure, upward and eastward to the eastern extremity of the field, at the point of contact of said upper Austin chalk with the Georgetown lime. On the extreme west edge the oil-saturated portion of the sand is very thin, being less than a foot or so in thickness; from the west edge of the field to the middle of the oil-saturated portion of the reservoir, or the so-called "fairway," it gradually increases in thickness until it attains a maximum thickness of about 90 to 100 feet in the "fairway." From the "fairway" to the east edge of the field, the oil-saturated sand gradually de-

creases in thickness until it is pinched out and vanishes on the east edge of the field. The woodbine sand extends in a westerly and upward direction from the west side of the field to an outcropping some 100 to 150 miles west and northwest of the field. Underlying approximately the west half of the oil-bearing sand and extending westward and upward to the outcropping is a vast amount of salt water occupying practically all of the Woodbine sand except that occupied by oil and gas. This salt water exerts pressure against the oil and gas in the reservoir. The pressure originally was some 1,650 pounds per square inch, but as the field has been produced the pressures have been reduced, and a pressure gradient has been built up across the field from west to east ranging from an average of nearly 1200 [fol. 745] pounds *pounds* per square inch on the west to an average of about 900 pounds per square inch on the east. The pressure of the water is the principal source of reservoir energy. As wells are drilled into the producing sand, the reservoir pressures, consisting of water pressure and the expansion of the gas in solution in the oil, force the oil to the surface through the wells, thus affording the energy by which flowing wells in the field are produced. With respect to pumping wells, artificial means must be used to lift the oil to the surface. The differential in pressures from west to east tends to drive the oil, as the field is produced, from west to east.

3. Gas is dissolved in the oil and will not come out of solution until pressures are reduced to approximately 750 pounds per square inch on the average. The presence of the dissolved gas makes the oil less viscous, and materially contributes to the movement of the oil through the pore spaces in the sand. If pressures are so reduced that gas comes out of solution, it will form bubbles in the producing sands and the oil will become more viscous, thus materially impairing the movement of oil through the sands. Gas has already come out of solution in a small area in the southeastern portion of the field.

4. Experience has shown that the field cannot for any extended period produce at a rate materially in excess of 400,000 barrels of oil per day without causing waste, considering that presently an average of about 200,000 barrels of water daily are being produced from the field with about 400,000 barrels of oil. If the top allowable for the

field is placed too high, the reservoir pressure will drop rapidly and create conditions conducive to waste; and, considering the varying densities to which properties in the field have been drilled, there will be non-ratable withdrawals from the field, if much of the allowable be prorated on the per-well or per-well potential basis, or any basis giving too much value to wells or potentials, thus resulting [fol. 746] in an uneven or irregular rise of the water table. This will cause large quantities of oil to be trapped off or enveloped by what is known as coning or channeling in the sand of the water, and will greatly reduce the ultimate recovery from the field, thus causing physical waste of oil which would otherwise be recoverable.

5. The Woodbine sand, in which the oil and gas are found in the field, is a very porous and highly permeable sand; there is intercommunication between all parts of the reservoir, thus permitting rather free movement of oil and gas from one portion of the reservoir to another. The fluids flow from areas of higher to areas of lower pressure, thus resulting not only in local migration of oil, but as the field is produced, the pressure of the waterhead at the west causes a general movement of oil upward and to the east. This is a normal movement in the light of the pressure gradient across the field, high on west, lower in the east. A well drilled into the reservoir and operated under proper conditions of control of reservoir pressure will effectively drain an area of at least ten acres.

6. The number of acre feet of net effective oil sand in the field, or in a lease in any portion of the field, can be determined actually and relatively with reasonable accuracy by taking into consideration such factors as the number of acres of land in a lease and the average thickness of the net oil sand under the lease. It is likewise possible to determine with reasonable accuracy, actually and relatively, the quantity of oil per acre foot of net effective oil sand, and the quantity of recoverable oil in the field and in the various leases in the field assuming the conditions under which the field is to be operated. This is done continually for taxing authorities, loans, sales, and similar purposes.

[fol. 747] 7. Plaintiff owns an oil and gas lease on a 28.25 acre tract in the W. H. Castleberry Survey in Gregg County, Texas, known as its Todd "A" lease. If a line were drawn

through the approximate center of the field, along the north to south axis of the field, it would mark the approximate center of the area of maximum thickness of the oil saturated sand, and is more or less the center or what is called the fairway or best part of the field. Plaintiff's lease is in the fairway or middle third of the field from north to south and some 3500 feet west of the above mentioned line. This area is most favorably situated on the structure, because of its thick sands of high permeability and porosity, large oil reserves, high potentials, and high bottom hole pressures; and either under open flow or under a plan of proration based on reserves, position on the structure, and similar factors, this area of the field would receive the benefit of its natural advantage over the east and west sides.

8. Competent petroleum engineers and geologists substantially agree concerning the amount of oil in place per acre foot of net oil sand in the East Texas field. The percentage of the oil which can be recovered per acre foot depends upon the manner in which the individual wells and the field as a whole are operated. If a proper allowable for the field is maintained, and leases and wells are allowed to produce ratably, that is, in reasonable relation to their ability to produce and their underlying reserves, a higher rate of recovery per acre foot in the field may reasonably be expected than if the allowable for the field is excessive, or if excessive localized withdrawals are permitted in densely drilled areas. The opinions of competent engineers and geologists have varied in the past and may vary in the future as to what the actual rates of recovery per acre foot in the field will be in the future, due in part to differences [fol. 748] in their assumptions as to the type of regulations that the Commission will enforce to control future operations in the field. Such change in estimates for the field may also be due to increased availability of information and better exchange of information among engineers and geologists. Such variances in estimated recovery, however, do not materially change the percentage which oil under plaintiff's lease bears to the total volume of oil in the field, because the changes are relative. The figures of the engineers of the Commission as to total estimated recovery per acre foot of sand in the field and as to the amount of oil in place under plaintiff's lease and the amount of oil in place in the field do not now vary substantially from those of plaintiff.

Whether the rate of recovery per acre foot in the field be estimated high, medium, or low, plaintiff's rightful percentage of the oil actually recoverable from the field as a whole under proper proration and production regulations should not vary materially, due to the relation which exists between the number of acre feet of oil sand under a lease and the number of acre feet of oil sand in the field as a whole.

9. The total acre feet of sand in the field is estimated at 4,990,350 acre feet; the total acre feet of sand under plaintiff's Todd "A" lease is estimated at 2,627 acre feet; the average sand thickness in the field is 37.86 feet; the average sand thickness under plaintiff's Todd "A" lease is 93 feet; the estimated recoverable oil per acre foot is 927.4 barrels; the revised estimate of the recoverable oil originally in the field is 4,628,054,299 barrels; the potentials and bottom hole pressures of wells on plaintiff's lease average 963 barrels per hour and 1115 pounds per square inch, respectively, as compared with the average of 605 barrels potentials and 1060 pounds pressure for the field; the revised estimate of the amount of recoverable oil originally under plaintiff's Todd "A" lease is 2,434,656 barrels; the [fol. 749] amount of oil produced to January 1, 1940, from the entire field was 1,447,821,784 barrels, or 31.28% of the estimated amount of recoverable oil originally in place; the amount of oil produced from plaintiff's Todd "A" lease to January 1, 1940, was 493,120 barrels, or 20.25% of the estimated amount of the recoverable oil originally in place under the lease; the daily allowable for the field is 690,000 barrels for each producing day; the daily allowable for plaintiff's Todd "A" lease is 260.52 barrels for each producing day.

10. The East Texas field has been drilled to an average density of one well to approximately 5.17 surface acres. A very large number of these wells could be closed in without creating waste, due to the fact that great density exists in numerous places throughout the field where substantially fewer wells would reasonably drain all of the oil under any such tract or tracts. Plaintiff's lease has been drilled to an average density of one well to about 4.03 surface acres, but being on an approximate parity with the average density (computed on a basis of surface acreage) of the field or having even a slightly greater density will not enable plain-

tiff under the present order to produce its fair share of the oil, because the average density is calculated on surface acreage, and surface acreage generally bears no real relation to oil in place, position on the structure, and other facts that go to show the oil reserves of a tract or the ability of a property to produce. On the basis of drilling density per one hundred acre feet of sand, the field is drilled to a density of one well to 192 acre feet; plaintiff's lease is only drilled to a density of one well to 375 acre feet, or approximately one-half the average density of the field. Plaintiff's part of the minimum allowable of 20 barrels per well per day is 20 barrels per 375 acre feet of sand. The average of the [fol. 750] field is 20 barrels per day per 192 acre feet of sand.

11. There are small and closely drilled tracts in the immediate vicinity of plaintiff's lease. R. M. Wood is the alleged owner of one, which is about 1100 feet south of plaintiff's "A" lease and contiguous to its "B" lease. Wood has one well on one-third of an acre, with a daily allowable of 24.11 barrels per day. He withdraws daily from his well 81 barrels per 100 acre feet of sand, while plaintiff is permitted to withdraw from its "A" lease only a little more than 10 barrels per 100 acre feet of sand. Plaintiff drilled its 7 wells prior to 1934. Wood drilled his well in August, 1937, and since that time, up to January 1, 1940, had produced 15,272 barrels, leaving only some 11,000 barrels of original recoverable oil, having produced, therefore, up to date, on the basis of 45,816 barrels per surface acre, as compared with plaintiff's 17,456 barrels per surface acre of its "A" lease. At the present rate of production, Wood will have recovered an amount of oil equal to the amount of recoverable oil originally estimated to be under his tract in a total of 425 more days of production, whereas, assuming continuation of present rate of flow and plan of proration, plaintiff will be more than twenty-one years recovering the balance of its oil. Wood, like plaintiff, has as much oil in place now as originally, and while plaintiff will not recover as much oil as its original reserves, due to the fact that the water has approached much closer and the oil supply of the field has diminished, Wood, due to the present plan of proration, will recover more than the equivalent of his original recoverable reserves. The defendants did not offer any substantial evidence, and there are not any substantial evi-

dence, to support the regulation requiring plaintiff to wait a long and indefinite period of time (if ever) to recover its [fol. 751] oil, while others, including some in the immediate area with its lease, are permitted to recover, use, and enjoy their property now.

12. The effect of the order on plaintiff, as compared with others, was developed by the testimony. For example, plaintiff has 2627 acre feet of sand under its "A" lease, with 7 wells on 28.25 surface acres; F. W. Fisher, on leases aggregating only 193 surface acres, with a total of 5,006 feet of sand, has a daily allowable of 1,692 barrels, as compared with plaintiff's 260 barrels. Fisher will get many times the amount of recoverable oil that was originally in place in his leases, while plaintiff will not be allowed to produce as much oil as the amount of oil it originally had or now has in place. While plaintiff's lease has a daily allowable of 10.11 barrels per hundred acre feet of sand, Hamil & Smith has a daily allowable of 62.62 barrels per hundred acre feet of sand; Pace Petroleum Company, with 4 wells on 1.4 acres, has a daily allowable of 140.9 barrels per hundred acre feet of sand, and the Ambassador Oil Company has a daily allowable of 127.15 barrels per hundred acre feet of sand. Numerous such situations were shown to exist throughout the field. There was not any evidence to support an order which so discriminates between operators and there was not any showing of any finding by the Commission, or evidence to support any finding by the Commission, that would justify such discrimination among operators as results from the order in question.

13. Since early in 1933, a 10-acre spacing rule has been in force. More than 65% of the wells completed in the field have been drilled as exceptions to the Commission's spacing rules. There is no uniformity of spacing in the field. The average density now is one well to about five surface acres. Throughout the field there are many tracts that have been drilled to a much greater density than one well to five acres, [fol. 752] many being drilled to as great a density as one well per one-tenth surface acre. To illustrate: 8133 acres have been drilled to an average density of one well to each 1.8 acres; and 38,293 acres have been drilled to an average density of one well to each 3.2 acres. Densely drilled areas are not confined to any particular part of the field, so it is quite apparent the condition does not exist as a result of an

attempt to conserve the oil and gas. The 20 barrel minimum per well per day provided by the order operates to the distinct advantage of these densely drilled tracts and allows them to produce many times as much oil as other tracts less densely drilled but with equally as great, and sometimes much greater, reserves. The former will get many times the amount of recoverable oil under their lease; the latter will get substantially less than the amount of recoverable oil under their leases. This plan of distribution results in the unnecessary drainage of plaintiff's lease that could be prevented without resulting in waste, and will prevent plaintiff ultimately recovering its proportionate or fair share of the recoverable oil originally or now in place under its lease.

14. The average production in the field per 100 acre feet is 13.28 barrels per day, while plaintiff, notwithstanding the fact that its Todd "A" lease is substantially better from the standpoint of reserves, pressures and other factors governing the productivity of a lease than the average of the field, is allowed to produce per day only 10.11 barrels per one hundred acre feet of sand, or about 76% of the average of the field.

15. The Commission's proration orders for the East Texas field of September 11 and September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith, are all substantially the same. Accompanying them were shut down orders. The shut down order of January 24, 1940, required the closing [fol. 753] of all wells in the East Texas field, except wells classed as marginal wells, for twelve days during the month of February, 1940.

16. The salient provisions of such proration orders and schedules are:

(a) They fix a top allowable for the field of approximately 691,000 barrels per producing day. Producing only four days a week, this averages about 400,000 barrels per day over the seven days of the week. If the other wells in the field were operated seven days a week like the marginal wells, the discrimination would be more pronounced.

(b) They allot 20 barrels per day to each well capable of making that many barrels, or more. There are some 25,456 wells of this kind to which are allotted (on the 20

barrel minimum) approximately 509,000 barrels per day under this particular clause of the order. These wells are closed in an average of three days a week under the February order.

(c) The wells incapable of making 20 barrels per day are allotted what they can make. These wells are classed as marginal wells. There were some 514 such wells to which are allotted some 6245 barrels per day. Under an interpretation of the marginal well law which the Commission has only recently applied in this manner (these wells, like all others, have for several years been closed in with all others), these so-called marginal wells are allowed to produce every day in the week. Since such wells only produce about 1% of the daily allowable, the court does not find it necessary to pass upon the validity either of this interpretation or the law itself.

(d) The balance of the field allowable, amounting to about 176,000 barrels per day, is allocated among wells capable of making more than 20 barrels per day. Each such well receives in addition to 20 barrels per day, an amount determined by multiplying the proratable oil, approximately [fol. 754] 176,000 barrels per day, by a fraction whose numerator is the product of the well's hourly potential by its bottom hole pressure by the thickness of the saturated Woodbine sand underlying the well by the average number of acres per well in the lease, and whose denominator is the sum of such products for all of the wells in the field. Approximately 75% of the daily field allowable is allocated among wells on the per well allowable of 20 barrels per day to each well, regardless of its capacity to produce, as long as it can produce the 20 barrels per day; and about 25% of the daily field allowable is allocated among wells on the formula set forth in this paragraph.

17. The allocation of a minimum allowance of 20 barrels per well per day to all wells in the field capable of producing that quantity of oil is made without regard to density of drilling on a lease or reserves under leases or the difference between the productive capacity of a well having a daily potential of 20,000 barrels and one having a daily potential of 21 barrels. The reasons or theory for giving the poorest well on small or densely drilled tracts in the poorest part of the field the same minimum allowable (20

barrels per day) as is given the best wells on large tracts in the best part of the field with a density of 1 well to 5 or 10 acres, thus taking up all but about 176,000 barrels of the daily allowable, are most vague and indefinite, and no substantial evidence was offered to justify any such plan or order, and there was no substantial evidence upon which such an order could be based. The arbitrary allowance of a minimum of 20 barrels per day to all wells that can produce that amount of oil is not necessary to prevent waste or to prevent drainage from one tract to another or from one section of the field to another, or to prevent premature abandonment of wells. On the contrary, it unnecessarily creates waste of the oil and energy, and obviously and necessarily causes migration of oil from one lease (including [fol. 755] plaintiff's) to others not so favorably situated and to densely drilled tracts, and causes low pressure areas and the gas to come out of solution in some sections of the field, and unreasonably takes oil from some operators (including plaintiff) and gives it to others.

18. Under the present and prior orders, the plaintiff has not produced over 200,000 barrels of oil it would have produced had said proration orders allocated the allowable among producers on a basis giving substantial effect to recoverable oil in place, true potentials, position on structure or similar factors which express the quantity of recoverable oil under tracts and their ability to yield such oil. The orders of September 11, 29, December 20, 1939, and January 24, 1940, gave plaintiff no real relief. While the Commission increased the daily allowable and thereby gave plaintiff more oil each day, all other wells that could produce it got more oil, and plaintiff's ratio of the daily field allowable remained practically the same. Under the order of June 19, 1939, if the then allowable of 522,000 barrels had been increased to 690,000, plaintiff would have been allowed to produce more oil than under the present order. Under the present order, plaintiff gets 68/100,000ths of the proratable oil. Under the order of June 19, 1939, it got 200/100,000ths of the proratable oil. The present plan of proration denies to plaintiff an equal opportunity with others in the production of oil. If the present or a similar plan of proration is continued for the producing life of the field, plaintiff will probably thereby be prevented from producing several hundred thousand barrels of recoverable oil

originally and now under its lease, and which plaintiff could produce without waste or injury to others under proper proration regulations. The present market value of oil in the field is $1.10 per barrel.

[fol. 756] 19. The exact reason, if any, why every well capable of making 20 barrels of oil per day is allowed to produce a minimum of 20 barrels a day does not appear from the evidence. Such a plan discriminates between wells and properties, and it is found to be unnecessary and unjustifiable because of the following facts:

(a) It does not tend to prevent waste, but contributes to unnecessary waste. It does not prevent drainage, but causes unnecessary and unreasonable drainage from one lease to another. It does not tend to give operators an equal opportunity to recover their oil, but tends to make recovery opportunities unequal, and allows one operator to take oil from another operator's lease.

(b) Of the approximately 25,900 wells in the field, about 15,000 could be closed in without creating waste. This could be done and at the same time, leave operators with wells sufficient adequately to drain their property. These unnecessary wells take up 300,000 barrels of the daily allowable as a result of the 20 barrels minimum; and, under the formula, an additional amount of the daily allowable is allocated them, leaving little oil to allocate to the better properties.

(c) Continuation of the policy of the Commission to grant additional permits, even though the field is now more than sufficiently drilled, can easily take up practically all of the allowable.

(d) Although under open flow conditions the "fairway" would have a distinct advantage over both the west and east sides of the field, due to water encroachment on the west and dissipation of pressures on the east, and the "fairway" with its maintained pressures would recover more recoverable oil than was under it, while the east and west would not recover as much, this allowance of 20 barrels reverses this natural advantage.

[fol. 757] (e) Since the east side is more densely drilled than some other sections of the field, and since heavy withdrawals on the east cause the gas to go out of solution, it

is quite apparent that the giving of 20 barrels to all of these wells unnecessarily draws upon the reservoir energy, all of which would be prevented substantially by reducing this allowance to 5 barrels per well or to 5 barrels per tract. Many of these wells have profitably pumped at the rate of only about 5 barrels per day on only 4 to 5 days a week, as shown by the Commission's schedules. Wells have not and will not be prematurely abandoned at 5 barrels a day. If the Commission, by pooling, unitizing, closing in of unnecessary wells, or the like, would reduce the withdrawals further on the east side and in other sections of the field, from a waste standpoint, this would benefit the field more. If the same were also done on the west side, where water is being produced, from the standpoint of waste, less would be created by such method, because the production of large quantities of water dissipates the lifting energy, and no oil would be lost, but would move up-structure to be recovered by other operators. Doing the same in the fairway would likewise be beneficial. Densely drilled tracts, many of which are to the east of the "A" lease, cause low pressure areas, and thus create waste likewise, wherever situated, and oil from other areas in the field not so densely drilled, like plaintiff's, migrates to these low pressure areas.

(f) The allocation of any substantial part of the allowable to wells, instead of allocating same principally on such factors as reserves, position on the structure, and the like, where spacing is so uneven, results in unreasonable and unnecessary drainage and waste.

[fol. 758] 20. Under any plan of proration, except one which causes all the rest of the field to be closed in, which is impractical and improper, the west side, as under open flow, will lose a substantial amount of oil. This is a natural disadvantage. The principal difficulty with the present order is the 20 barrel minimum. If it were eliminated, operators would, under the other parts of the order, produce more nearly in relation to their reserves and position on the structure and on more nearly an equal basis with others and with more nearly an equal opportunity. The loss to the west could be reduced to some extent, if the Commission desires, by a slight adjustment of its present formula without the 20 barrel minimum. The 20 barrel

minimum applied to the entire field does not remedy or tend to remedy this condition. The writing of a formula, however, is strictly up to the Commission, and this finding is made only to show the unreasonableness of the 20 barrel minimum.

21. As a consequence of the method of allocation used, densely drilled leases in any part of the field receive much more allowable in proportion to reserves than neighboring leases less densely drilled; and leases in the eastern and western portions of the field, where the oil sand is relatively thin, are allotted much higher allowables in proportion to their reserves than are leases in the "fairway" where the oil sands are thickest and the reserves greatest. The "fairway" properties, except those which are very densely drilled, are being and will be severely drained, by the leases lying in the eastern part of the field. This is a result of the present plan of proration, and plaintiff "A" lease is one of those so suffering drainage. Under the existing order, or orders similar thereto, the less densely drilled areas and particularly leases in the "fairway," including plaintiff's "A" lease, are not afforded an opportunity currently to [fol. 759] recover their fair share of the oil, and in all reasonable probability will not, under the present plan of proration, ultimately recover substantially the equivalent of the recoverable reserves originally or now under them; while the densely drilled leases and leases particularly in the eastern portion of the field are currently afforded an opportunity to recover far in excess of their fair share, and ultimately will in all reasonable probability be afforded an opportunity to produce far in excess of the equivalent of the reserves originally and now underneath them.

22. There is not any reasonable probability that the time element will take care of plaintiff under the present plan of proration. The producing sand to the east of plaintiff's lease is much higher than even the top of plaintiff's sand, and as the water approaches from the west, the oil under plaintiff's lease is being pushed up-structure to the east faster than plaintiff is allowed to produce. If the present plan is continued, the effect of this movement will increase with time, and prevent plaintiff's recovering an amount of oil substantially equivalent to its original recoverable reserves or its present recoverable reserves. The abandonment of wells along the small band around the east side, due

largely to fingerings of sand into the shale, lack of oil in the first place, and mechanical equipment or method of completion, and abandonments on the west by water encorachment, will afford plaintiff no substantial relief. Additional wells are now being permitted to be drilled by the Commission.

23. There is no substantial evidence to justify the Commission's permitting operators on the east and in other poorer sections of the field and on small or densely drilled tracts to produce disproportionately in reference to reserves and position on the structure now while plaintiff is required to wait an indefinite period of time (if ever) to get its oil. The practice does not prevent waste or prevent [fol. 760] drainage, but on the contrary, causes unnecessary waste and drainage.

24. It costs about $10,000.00 to drill and equip an oil well in the East Texas field. It costs about $2500.00 to equip a well with pumping equipment. Most pumping wells in the East Texas field can be operated at a profit on a daily production of as little as 5 barrels each. Many pumping wells in the field have been operated over a period of years on an average production of less than 5 barrels per day, as shown by the Commission's schedules. A few pumping wells on the west, if producing large quantities of water, may not be able to operate at a profit if producing no more than 5 barrels of oil per day; but if such wells were closed in, practically all, if not all, of the recoverable oil in the tracts on which such wells are located could be produced by other wells, and no substantial physical waste of oil would result from the abandonment of such wells. Flowing wells in the East Texas field can be operated at a profit on less than 5 barrels per day production.

25. Practically all wells in the field have been drilled more than two years, and have produced more than a sufficient amount of oil to pay for the cost of drilling, equipping, and operating such wells. Some of the wells drilled within two years from this date have doubtless paid out, while many of the wells drilled less than two years ago have in a large measure paid out.

26. Plaintiff has repeatedly and diligently endeavored to obtain administrative relief from the Railroad Commission

of Texas, and to secure an adjustment of the allowable for its wells in the East Texas field in such manner as to afford it an opportunity currently and ultimately to produce its fair share of the oil from the field. In spite of such efforts the defendant Commission has failed and refused to grant to plaintiff the relief sought.

[fol. 761] 27. Enforcement of the present plan of proration results in the taking of plaintiff's property and giving it to others, without any compensation and without any reasonable necessity. Plaintiff is denied a reasonable opportunity to produce currently a very substantial quantity of oil which it would be entitled to produce under a proper method of regulation. The loss to plaintiff under such a program amounts to a substantial sum daily, and will amount to a very substantial sum (many times exceeding the minimum jurisdiction of this court) over a period of years, if the program be continued.

28. The regulation by the Commission does not allocate or distribute the allowable production for the field on a reasonable basis, and is arbitrary, discriminatory, confiscatory, and unreasonable as applied to plaintiff. It denies to plaintiff a reasonable opportunity to recover its fair share of the oil ultimately, much less within a reasonable time, resulting in a daily loss of much oil worth several hundred dollars, and in the course of a month, a loss of many thousand of dollars, and results daily in a preventable drainage of oil from plaintiff's lease to the leases of other operators.

B

Conclusions of Law

In view of the facts found above, concerning which there really is little or no dispute in the evidence, the following conclusions of law are applicable:

1. This court has jurisdiction of the persons and subject matter involved in this action.

2. Subject to the interests of its royalty holders, which oil it must produce for their credit, plaintiff is the owner of the oil and gas in place under its lease in the East Texas field.

[fol. 762] 3. As the owner of said lease, the plaintiff is legally entitled currently and ultimately to produce its fair share of the oil produced from the field.

4. Under the statutes of Texas, Articles 6023, 6029, and Section 7 of Article 6049-c, Vernon's Annotated Revised Civil Statutes, the Railroad Commission is the administrative agency charged with the duty of preventing waste; and in administering the conservation statutes is required to apportion or allocate production of oil among properties in each field "on a reasonable basis."

5. The orders of the Commission of September 11 and September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas field, as interpreted, applied, and enforced against plaintiff (such orders and schedules being often referred to herein as the Commission's program of regulation for the field) are unreasonable, discriminatory, confiscatory and void as to plaintiff. As to plaintiff, they do not allocate the production in the field on a reasonable basis, as required by the statutes of Texas referred to in the preceding paragraph.

6. The program of regulation complained of by plaintiff does not within reasonable limits protect the property rights or privileges of plaintiff; it does not give to plaintiff the opportunity to produce currently its fair share of the daily allowable, or prevent reasonably avoidable drainage of its property, although plaintiff has more than enough wells already drilled on its property from which its fair share can be produced without waste. To require plaintiff to drill any further or additional wells upon its property would be to require plaintiff to make unnecessary and wasteful expenditures of money and, in itself, would be a confiscation of plaintiff's property.

[fol. 763] 7. Such program of regulation operates to confiscate plaintiff's property, and unreasonably discriminates against plaintiff, contrary to the due process and equal protection clauses of the Fourteenth Amendment to the Constitution of the United States; and such program of regulation is void as far as plaintiff is concerned. It is not necessary to prescribe and enforce such a program of regulation

against plaintiff in the East Texas field in order to prevent physical waste of oil and gas, or for any other reason.

8. Plaintiff is currently suffering immediate and irreparable injury under such program of regulation, and, so long as such program is maintained in force and effect, will continue to suffer irreparable injury. Plaintiff is without an adequate remedy at law to protect itself against losses which have occurred and which will continue to occur under the program of regulation now in vogue. An injunction restraining defendants from enforcing such a program of regulation against plaintiff in the East Texas field is necessary to the protection of plaintiff's property.

9. The marginal well statute (Acts of 1931, 42nd Leg., Reg. Sess., p. 92, c. 58; Article 6049b of Vernon's Annotated Revised Civil Statutes of Texas) is not patently invalid. Since it appears that less than 1% of the total daily allowable production from the field is allotted to marginal wells as defined by the statute, the court finds it unnecessary to pass upon the validity of said marginal well law or the present interpretation placed thereon by the Commission.

10. The law does not require that plaintiff should seek relief from the Commission before bringing this action, but even conceding that, as a general rule, relief from a court should not be sought if the same relief could promptly be obtained by application to the administrative agency (Commission in this instance), then it appears that plaintiff, an interested person, has already sought such relief [fol. 764] from the Commission and has fully exhausted its administrative remedy without obtaining relief.

11. There was no substantial evidence to support the Commission's order and there was no showing made that the Commission had based the order on any finding, and there was no substantial evidence to support a finding upon which the order could be based.

12. The record shows virtually no dispute as to the facts. The law being clear as applied to such facts, the court finds that an injunction should issue, substantially as prayed for by plaintiff, enjoining defendants from enforcing, or attempting to enforce, the orders and schedules complained of against plaintiff or its properties in the East Texas field, or from suing for or otherwise attempting to claim or collect

penalties, or to enforce forfeiture, or in any other manner to penalize plaintiff or the oil produced as set forth in the final judgment to be entered in this action as directed by the court.

The final judgment is directed accordingly.
Done as of date the 29th day of May, 1940.
(S.) Saml. H. Sibley, Circuit Judge. (S.) James V. Allred, District Judge. (S.) Robert J. McMillan, District Judge.

[File endorsement omitted.]

[fol. 765] IN UNITED STATES DISTRICT COURT

[Title omitted]

MOTION FOR STAY OF JUDGMENT—Filed March 1, 1940

To said Honorable Court:

Come now the defendants, the Railroad Commission of Texas and Lon A. Smith, Ernest O. Thompson and Jerry Sadler, the members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, in their official and individual capacities, and respectfully move the court to grant a stay of its judgment, and as grounds for this motion, defendants say:

I

This court on February 21, 1940, announced its decision to enter a judgment granting to the plaintiff, Rowan & Nichols Oil Company, a final injunction restraining the defendants from enforcing or attempting to enforce the proration orders of the Railroad Commission of Texas attacked in this action by the plaintiff, or any similar orders substantially the same as the orders attacked by the plaintiff in its supplemental complaint. Defendants will prosecute an appeal from said judgment to the Supreme Court of the United States. Defendants say that in equity and good conscience the injunction of the court should be stayed pending a reasonable time within which the defendants may [fol. 766] perfect their appeal to the Supreme Court of the

United States, and pending the final determination of such appeal, for the following reasons:

(1) A stay of the judgment of the court should be granted in order that defendants' right of appeal may not be rendered practically ineffective, and in order that serious and irreparable injury may not be done to the defendants and to the East Texas oil field and the oil industry of the State of Texas as a whole.

(2) The effect of the judgment of the court, granting an injunction against the enforcement of the proration orders of the Railroad Commission of Texas for the East Texas field, will be to destroy and not to preserve the status quo.

(3) Said judgment should be stayed because a state of great inequity, uncertainty and confusion in the East Texas oil field will be prevented by staying said judgment. While the court does not hold the proration order invalid except as to the plaintiff in this case, it is evident that if the court's judgment is finally affirmed, there must be a complete revision of the proration orders of the Railroad Commission applicable to the East Texas oil field. The property rights of the owners and operators in the East Texas field will be uncertain until a final determination of this cause by the Supreme Court of the United States can be obtained. Unless a stay is granted, a situation of inequality between the Rowan & Nichols Oil Company and other operators whose properties are adjacent to the property of Rowan & Nichols Oil Company, or whose properties are similarly situated, will be created, by reason of the fact that the Rowan & Nichols Oil Company will be allowed to produce a larger proportionate share of the allowable production fror the field than others similarly situated. Such operators w. be faced with the alternative of complying with the orde of the Railroad Commission and receiving a smaller proper-
[fol. 767] tionate share of the total field allowable than the Rowan & Nichols Oil Company, or of filing suit against the Railroad Commission to enjoin the proration orders of the Railroad Commission, and having the district court fix the amount of oil which such operators can produce. Since the court is obviously without power to promulgate a general proration order applicable to the East Texas field, and since each of such suits must be determined upon the particular facts in such suit, it will inevitably result that there

will be much confusion and great inequality among the various operators in the East Texas field. Such inequality, confusion and uncertainty can be prevented if a stay is granted so that all operators will continue to receive the amounts allowed by the present proration order until the validity of such order can be finally determined by the Supreme Court of the United States. After the appeal is finally determined by the Supreme Court of the United States, the Railroad Commission will then be able to formulate and promulgate an order which will comply with the law as finally settled by that court, and which will be equally applicable to all operators within the field.

(4) The plaintiff will not suffer any irreparable injury from a continuation of the present method of proration pending this appeal. An appeal to the Supreme Court of the United States would be prosecuted promptly and with expedition by the defendants, and the defendants would make motion to advance such appeal, and a final determination of this case by the Supreme Court of the United States could probably be obtained within a period of three or four months. The evidence in this case shows that according to the estimates of its own engineers, there has been no depletion of the Rowan & Nichols Oil Company's lease and said lease [fol. 768] now has beneath it the same amount of oil as was originally in place beneath said base. The rate of withdrawal from the East Texas field under the present method of proration is comparatively slow, and the plaintiff will suffer no uncompensated drainage from any of the surrounding tracts during the time which will elapse before a final determination before the Supreme Court of the United States can be obtained.

(5) Any damage or injury which may result to the plaintiff as a result of the stay of judgment entered by the court in this case will be greatly out-weighed by the injury which will be done to other operators in the East Texas field, and to the oil industry in the State of Texas as a whole, by reason of the confusion, uncertainty and inequality which will be caused if plaintiff is allowed to produce a greater proportion of oil, during the pendency of this appeal, than the remaining operators in the East Texas field. If a stay of the court's judgment is granted, it will be unnecessary for other operators in the East Texas oil field to file suits in order

to protect their leases from drainage. If a stay is refused, however, a great number of lawsuits will inevitably be filed by persons similarly situated adjacent to the Rowan & Nichols Oil Company property. Such lawsuits will necessarily be very complicated and expensive to the Railroad Commission of Texas, and will require a large expenditure of public funds in the defense of such cases. Such multiplicity of suits can be prevented by staying the operation of the judgment pending appeal. More important, however, than such expense and the direct effect upon the defendants, is the effect of such refusal to grant a stay upon the other operators in the East Texas field and the oil industry in the State of Texas and throughout the nation. The effect of prorating the field by court injunction will not only be to create a state of confusion and inequality, but also [fol. 769] to increase greatly the total production from the East Texas field to the point where there will probably be a large amount of physical waste of oil and gas. In effect, all efforts to regulate and prorate production of oil from the East Texas field will be suspended, pending the appeal, unless a stay of the court's judgment is granted. The Railroad Commission has received information which causes it to believe that if this stay is not granted, there will be a number of suits filed immediately which will involve a large percentage of the producing acreage in the East Texas oil field.

(6) Unless a stay is granted, there will be no method whereby the parties can be restored to their present position in the event the judgment of the trial court is reversed by the Supreme Court of the United States. If the Rowan & Nichols Oil Company is permitted to produce oil in excess of its present allowables pending an appeal, in the event the judgment of this court is reversed, there will be no method of restoring to the adjoining land owners the oil which the Rowan & Nichols Oil Company will drain from under their tract by reason of their increased allowable; nor will there be any method whereby the Railroad Commission can require the Rowan & Nichols Oil Company to reduce its future allowable so as to account for the excess oil which it will have produced pending appeal, and the judgment of the Supreme Court of the United States will, to such extent, be rendered ineffective.

II

Defendants say that they have no personal interest in the case, but that they are prosecuting the same in order to have a final determination of the validity of the method of proration involved in the orders of the Railroad Commission of Texas under attack in this State. Defendants have no method under the laws of the State of Texas whereby [fol. 770] they can make a supersedeas bond, in their official capacities as members of the Railroad Commission of Texas or as Attorney General of Texas. Defendants say it would be impossible for them individually to make a bond, and that it would be unjust to require them to submit to personal liability as a condition of obtaining a stay of the judgment where, in effect, the appeal can be effective only if the stay is granted.

Wherefore, defendants pray that this court stay the operation and execution of the permanent injunction against the enforcement of the proration orders of the Railroad Commission of Texas as applicable to the East Texas oil field, during a reasonable time in which defendants may perfect their appeal to the Supreme Court of the United States, and pending a final determination of such appeal by said court, that no bond be required of defendants as a condition for such stay, and for such other relief as may be proper in the premises.

Gerald C. Mann, Attorney General of Texas; (S.) James P. Hart, Assistant Attorney General; (S.) Edgar Cale, Assistant Attorney General; (S.) Tom D. Rowell, Jr., Assistant Attorney General; (S.) E. R. Simmons, Assistant Attorney General, Attorneys for Defendants Railroad Commission of Texas, et al., Austin, Texas.

Duly sworn to by F. V. L. Patten. Jurat omitted in printing.

[fol. 771] Proof of Service

Service of the foregoing motion was made by me by delivering a copy thereof to Rice Tilley, Esq., attorney for

Plaintiff at the United States Court House on the 1st day of March, A. D. 1940, at 2 o'clock p. m.

(S.) James P. Hart.

[File endorsement omitted.]

[fol. 772] IN UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL—Filed June 14, 1940

To Said Honorable Court:

Now come the defendants, the Railroad Commission of Texas, and Lon A. Smith, Ernest O. Thompson and Jerry Sadler, Members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, in their official and individual capacities, and feeling themselves aggrieved by the judgment of this court entered herein on the 29th day of May, 1940, granting a permanent injunction in favor of the plaintiff and against the defendants, pray an appeal therefrom to the Supreme Court of the United States.

The particulars wherein they consider the said judgment erroneous are set forth in their assignment of errors on file and which accompanies this petition.

Wherefore, your petitioners pray that an appeal in their behalf to the Supreme Court of the United States for the correction of errors complained of and herewith duly assigned be allowed; that an order be made fixing the amount of the security to be given by these defendants as appellants and conditioned as the law requires; and they pray a [fol. 773] reversal of said judgment and for such other and further relief as shall be just and proper.

Dated this 14th day of June, 1940.

(S.) Gerald C. Mann, Attorney General of Texas; James P. Hart, Assistant Attorney General; Tom D. Rowell, Jr., Assistant Attorney General; Edgar Cale, Assistant Attorney General; E. R. Simmons, Assistant Attorney General, Attorneys for Defendants, Austin, Texas.

[File endorsement omitted.]

[fol. 774] IN UNITED STATES DISTRICT COURT

[Title omitted]

ASSIGNMENT OF ERRORS—Filed June 14, 1940

To Said Honorable Court:

Now come the defendants, the Railroad Commission of Texas, and Lon A. Smith, Ernest O. Thompson and Jerry Sadler, members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, in their individual and official capacities and in connection with their petition for appeal file the following assignment of errors on which they will rely on their appeal to the Supreme Court of the United States from the final judgment of the three-judge District Court, dated May 28, 1940, and entered on the 29th day of May, 1940, granting a permanent injunction in favor of the plaintiff and against the defendants.

The said three-judge District Court erred:

1. In holding that the District Court has jurisdiction to pass upon the fairness and reasonableness of the administrative orders of the Railroad Commission of Texas involved in this action.

2. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939 and January 24, 1940, and the schedules issued in connection therewith for the East Texas field as interpreted, applied and enforced against plaintiff, are unreasonable, discriminatory, confiscatory and void as to plaintiff.

3. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the [fol. 775] schedules issued in connection therewith for the East Texas field, as interpreted, applied, and enforced against the plaintiff, do not apportion or allocate the production of oil from said field on a reasonable basis, as required by the statutes of the State of Texas.

4. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas

field, as construed, applied and enforced to control production from plaintiff's wells, deprive plaintiff of its property contrary to the statutes of the State of Texas.

5. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas field, as construed, applied and enforced to control production from plaintiff's wells, deprive plaintiff of its property and discriminate against it in violation of the due process and equal protection clauses of the 14th Amendment to the Constitution of the United States.

6. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, inflict upon plaintiff daily and currently irreparable injury.

7. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, inflict upon plaintiff injuries for [fol. 776] which the plaintiff has no adequate remedy at law.

8. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, will, if continued substantially in effect, cause injury to the plaintiff in the future.

9. In holding that the plaintiff is legally entitled to recover currently an amount of oil which is in the same proportion to the total allowable for the East Texas field as the estimated recoverable oil underneath the plaintiff's lease is to the estimated recoverable oil under the East Texas field as a whole.

10. In holding that the right to apply to the Railroad Commission for permission to drill additional wells as ex-

ceptions to the spacing rules of the Railroad Commission does not constitute an administrative remedy whereby the plaintiff can protect itself against loss and increase its share in the allowable production from the East Texas field.

11. In holding that the plaintiff is entitled to injunctive relief from the court, although plaintiff wholly failed to allege or prove that it has applied to the Railroad Commission for permits to drill additional wells upon its lease in question, or that the Railroad Commission has refused to grant it permits to drill wells upon such lease.

12. In holding that the plaintiff has exhausted its administrative remedy before seeking relief from this court.

13. In permanently enjoining the plaintiff from enforcing or attempting to enforce the proration orders and schedules complained of against the plaintiff and its properties in the East Texas field.

[fol. 777] 14. In permanently enjoining the defendants from enforcing or attempting to enforce all proration orders, rules, regulations and schedules which have been or may be promulgated by the Railroad Commission of Texas for the East Texas field in renewal or extension of the proration orders of December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith, or which are or may be substantially the same effect as said orders and schedules, as the same have been construed, enforced and applied to control production from plaintiff's said property.

15. In holding that the program of regulation complained of by plaintiff does not give to plaintiff the opportunity to produce currently its fair share of the daily allowable from the East Texas field.

16. In holding that the program of regulation complained of by plaintiff does not prevent reasonably avoidable drainage of plaintiff's property.

17. In holding that the program of regulation complained of by plaintiff is not necessary in order to prevent physical waste of oil and gas.

18. In holding that there was no substantial evidence to support the Commission's order complained of by the plaintiff.

19. In holding that there was no showing made in this action that the Commission had based its order on any finding.

20. In holding that there was no substantial evidence to support a finding by the Railroad Commission of Texas upon which its orders complained of by the plaintiff in this case could be based.

21. In holding that if much of the allowable be prorated on the per well or potential basis, there will result a physical waste of oil.

[fol. 778] 22. In holding that the quantity of recoverable oil in the field and in the various leases of the field can be determined with reasonable accuracy.

23. In holding that the fairway properties under the present method of proration are being and will be severely drained by the leases lying in the eastern part of the field.

24. In holding that the plaintiff's Todd "A" lease is suffering drainage under the present plan of proration to leases on the east side of the field.

25. In holding that under the present plan of proration the plaintiff will be prevented from recovering an amount of oil substantially equivalent to its original recoverable reserves or to its present recoverable reserves.

26. In holding that most pumping wells in the East Texas field can be operated at a profit on a daily production of as little as five barrels each.

27. In holding that the enforcement of the present plan of proration results in the taking of plaintiff's property and giving it to others without compensation and without any reasonable necessity.

28. In holding that the regulation of the Railroad Commission attacked denies to the plaintiff a reasonable opportunity to recover its fair share of the oil ultimately and within a reasonable time.

29. In finding, without sufficient evidence to support such finding, that under the present and prior orders of the Railroad Commission of Texas, prorating the production of oil from the East Texas oil field, the plaintiff has not produced "over 200,000 barrels of oil it otherwise would

have produced had said orders allocated the allowable among producers on a basis giving substantial consideration to recoverable oil in place, true potentials, position on [fol. 779] structure or similar factors which bear on the quantity of recoverable oil under tracts and the ability to yield such oil."

30. In finding, without sufficient evidence to support such finding, that if the present or a similar plan of proration is continued for the producing life of the field, plaintiff will be prevented from producing several hundred thousand barrels of recoverable oil originally and now under its lease.

31. In finding, without sufficient evidence to support such finding, that of the 25,900 wells in the East Texas field, about 15,000 of such wells could be closed in at the present time without creating waste.

32. In finding, without sufficient evidence to support such finding, that out of the 25,900 wells drilled in the East Texas field, about 15,000 of these wells could be closed in and leave operators with sufficient wells to drain their property.

33. In finding, without sufficient evidence to support such finding, that the density of drilling which has been permitted by the Railroad Commission of Texas after due notice and hearing as to the drilling of each well, does not exist as a result of an attempt to conserve the oil and gas.

34. In holding that the allocation of a base or minimum allowable of 20 barrels per well to each well in the field which was capable of producing 20 barrels or more per day is unreasonable and arbitrary.

35. In holding that there was no substantial evidence to sustain the base or minimum allowable of 20 barrels per well allocated by the Railroad Commission to each well in the field which was capable of producing 20 barrels or more per day.

36. In holding that the allowance of a minimum or base allowable of 20 barrels per day to all wells that can produce that amount of oil is not necessary to prevent waste.

[fol. 780] 37. In holding that the allowance of a minimum or base allowable of 20 barrels per day to all wells that can produce that amount of oil daily is not necessary to prevent drainage from one section of the field to another.

38. In holding that the allowance of a base or minimum allowable of 20 barrels per day to all wells that can produce that amount of oil daily is not necessary to prevent premature abandonment of wells.

39. In holding that the allowance of 20 barrels per well per day as a base or minimum allowable to all wells capable of producing that amount of oil daily creates waste of oil and energy.

40. In holding that the allowance of a base or minimum allowable of 20 barrels per day to each well in the field capable of producing that amount daily denies to the plaintiff the opportunity to produce its fair or proportionate share of the daily allowable.

41. In holding that the plaintiff's share of the total field allowable was not substantially increased by the orders of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, as compared with the order of June 19, 1939.

42. In finding, without sufficient evidence to support such finding, that wells have not and will not be prematurely abandoned in the East Texas field with a production of five barrels per day.

43. In holding that the allocation of any substantial part of the allowable per well results in unnecessary and unreasonable drainage and waste.

44. In finding, without sufficient evidence to support such finding, that the time element will not "take care of plaintiff."

[fols. 781-822] 45. In finding, without sufficient evidence to support such finding, that the plaintiff does not have substantially as much recoverable oil beneath its lease as was under such lease originally.

46. In finding, without sufficient evidence to support such finding, that the premature abandonment of wells on the west side of the field will not result in the physical waste of oil and gas.

47. In finding, without sufficient evidence to support such finding, that practically all wells in the East Texas field have been drilled more than two years.

48. In holding that it is not necessary that the Railroad Commission give any consideration to the cost of drilling or the cost of pumping wells in the East Texas field in determining the amount of allowable that shall be assigned to each well in the field.

49. In the rendition of the final judgment dated May 28, 1940, in favor of plaintiff and against defendants.

Wherefore, defendants pray that said judgment be reversed, and for such other and further relief as to the court may seem just and proper.

(S.) Gerald C. Mann, Attorney General of Texas. (S.) James P. Hart, Assistant Attorney General. (S.) Tom D. Rowell, Jr., Assistant Attorney General. (S.) Edgar Cale, Assistant Attorney General. (S.) E. R. Simmons, Assistant Attorney General, Attorneys for Defendants, Austin, Texas.

[File endorsement omitted.]

* * * * * * * *

[fol. 823] IN UNITED STATES DISTRICT COURT FOR THE WESTERN DISTRICT OF TEXAS, AUSTIN DIVISION

Civil Action. No. 46

ROWAN & NICHOLS OIL COMPANY, Plaintiff,

vs.

RAILROAD COMMISSION OF TEXAS, et al., Defendants

ORDER ALLOWING APPEAL—Filed June 14, 1940

It appearing to the court that the defendants, the Railroad Commission of Texas, and Lon A. Smith, Ernest O. Thompson and Jerry Sadler, Members of the Railroad Commission of Texas, and Gerald C. Mann, Attorney General of Texas, in their official and individual capacities, have filed their petition for appeal to the Supreme Court of the United States as required by Rule 12 of the Supreme Court rules, duly disclosing that the Supreme Court of the United States has jurisdiction upon appeal to review the judgment in question;

It is Therefore Ordered by the Court that the appeal prayed for be and the same is hereby allowed to the Su-

preme Court of the United States from the judgment entered in said cause on the 29th day of May, 1940, granting a permanent injunction in favor of the plaintiff and against the defendants upon the defendants' giving a bond with good and sufficient security in the sum of $500.00, conditioned as required by law.

Dated this 14th day of June, 1940.

(S.) Robert J. McMillan, Judge, District Court of the United States for the Western District of Texas.

Entered: Civ. O. B., Vol. 1, page 123.

[fol. 824] [File endorsement omitted.]

[fols. 825-826] Citation in usual form showing service on Dan Moody, filed June 15, 1940, omitted in printing.

[fols. 827-828] Bond on appeal for $500.00 approved and filed June 14, 1940, omitted in printing.

[fol. 829] In United States District Court

[Title omitted]

Stipulation as to Record on Appeal—Filed June 15, 1940

Pursuant to the provisions of Section 2 of Rule 10 of the Rules of the Supreme Court of the United States it is stipulated by the parties to this action that the following parts of the record, proceedings and evidence shall be included in the record on appeal:

1. Plaintiff's original complaint.
2. Defendants' answer to plaintiff's complaint.
3. Plaintiff's supplemental complaint.
4. Defendants' answer to plaintiff's supplemental complaint.
5. Order constituting and assembling three-judge court, dated February 6, 1940.
6. Writ to serve copy of order convening statutory three-judge court issued for Governor W. Lee O'Daniel, and marshal's return thereon.
7. Writ to serve copy of order convening statutory three-

judge court on Railroad Commission of Texas, Lon A. Smith, E. O. Thompson, Jerry Sadler and Gerald C. Mann, with marshal's return thereon.

8. The reporter's transcript of the evidence; certified by H. P. Bickler, Court Reporter.

[fol. 830] 9. Opinion of the court, after trial on the merits February 21, 1940.

10. Final judgment of the court, dated May 28, 1940.

11. Findings of fact and conclusions of law, dated May 29, 1940.

12. Defendants' motion for a stay pending appeal.

13. Defendants' petition for appeal.

14. Defendants' assignment of errors.

15. Defendants' statement as to jurisdiction as required by Rule 12 of the Rules of the Supreme Court of the United States.

16. Order allowing appeal.

17. Citation on appeal, with acknowledgment of service thereof.

18. Appeal bond.

19. Stipulation of the parties as to the record.

20. Notice of appeal, etc., under Supreme Court Rule 12, and acknowledgment of service thereof, omitting exhibits.

It is further stipulated by the parties that all of the original papers and exhibits which have been transmitted to the Supreme Court of the United States for inspection by that court in Case No. 57, October Term, 1940, in the Supreme Court of the United States, entitled Railroad Commission of Texas, et al., v. Humble Oil & Refining Company, may be considered by the Supreme Court on the appeal in this case, said Case No. 57 having been tried jointly with this action.

Dated this 15th day of June, 1940.

(S.) Dan Moody, Attorney for Plaintiff, Rowan & Nichols Oil Company, (S.) James P. Hart, Attorney for Defendants, Railroad Commission of Texas, Lon A. Smith, Ernest O. Thompson, G. A. Sadler, and Gerald C. Mann, Attorney General of Texas.

[fols. 831-833] [File endorsement omitted.]

[fol. 834] Clerk's Certificate to foregoing transcript omitted in printing.

[fol. 835] SUPREME COURT OF THE UNITED STATES

STATEMENT OF THE POINTS ON WHICH APPELLANTS INTEND TO RELY AND OF THE PARTS OF THE RECORD WHICH APPELLANTS THINK NECESSARY FOR THE CONSIDERATION THEREOF —Filed July 8, 1940

The appellants intend to rely upon the following points in which it is contended by appellants that the three-judge District Court erred:

1. In holding that the District Court has jurisdiction to pass upon the fairness and reasonableness of the administrative orders of the Railroad Commission of Texas involved in this action.

2. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas field as interpreted, applied and enforced against plaintiff, are unreasonable, discriminatory, confiscatory and void as to plaintiff.

3. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas [fol. 836] field, as interpreted, applied, and enforced against the plaintiff, do not apportion or allocate the production of oil from said field on a reasonable basis, as required by the statutes of the State of Texas.

4. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas field, as construed, applied and enforced to control production from plaintiff's wells, deprive plaintiff of its property contrary to the statutes of the State of Texas.

5. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith for the East Texas field, as construed, applied and enforced to control production from plaintiff's wells, deprive plaintiff of its property

and discriminate against it in violation of the due process and equal protection clauses of the 14th Amendment to the Constitution of the United States.

6. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, inflict upon plaintiff daily and currently irreparable injury.

7. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, inflict upon plaintiff injuries for which the plaintiff has no adequate remedy at law.

[fol. 837] 8. In holding that the proration orders of the Railroad Commission of Texas of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, allocating among wells in the East Texas field the daily field allowable, as construed, applied and enforced to control production from plaintiff's wells, will, if continued substantially in effect, cause injury to the plaintiff in the future.

9. In holding that the plaintiff is legally entitled to recover currently an amount of oil which is in the same proportion to the total allowable for the East Texas field as the estimated recoverable oil underneath the plaintiff's lease is to the estimated recoverable oil under the East Texas field as a whole.

10. In holding that the right to apply to the Railroad Commission for permission to drill additional wells as exceptions to the spacing rules of the Railroad Commission does not constitute an administrative remedy whereby the plaintiff can protect itself against loss and increase its share in the allowable production from the East Texas field.

11. In holding that the plaintiff is entitled to injunctive relief from the court, although plaintiff wholly failed to allege or prove that it has applied to the Railroad Commission for permits to drill additional wells upon its lease in

question, or that the Railroad Commission has refused to grant it permits to drill wells upon such lease.

12. In holding that the plaintiff has exhausted its administrative remedy before seeking relief from this court.

13. In permanently enjoining the plaintiff from enforcing or attempting to enforce the proration orders and schedules complained of against the plaintiff and its properties in the East Texas field.

[fol. 838] 14. In permanently enjoining the defendants from enforcing or attempting to enforce all proration orders, rules, regulations and schedules which have been or may be promulgated by the Railroad Commission of Texas for the East Texas field in renewal or extension of the proration orders of December 20, 1939, and January 24, 1940, and the schedules issued in connection therewith, or which are or may be substantially the same effect as said orders and schedules, as the same have been construed, enforced and applied to control production from plaintiff's said property.

15. In holding that the program of regulation complained of by plaintiff does not give to plaintiff the opportunity to produce currently its fair share of the daily allowable from the East Texas field.

16. In holding that the program of regulation complained of by plaintiff does not prevent reasonably avoidable drainage of plaintiff's property.

17. In holding that the program of regulation complained of by plaintiff is not necessary in order to prevent physical waste of oil and gas.

18. In holding that there was no substantial evidence to support the Commission's order complained of by the plaintiff.

19. In holding that there was no showing made in this action that the Commission had based its order on any finding.

20. In holding that there was no substantial evidence to support a finding by the Railroad Commission of Texas upon which its orders complained of by the plaintiff in this case could be based.

21. In holding that if much of the allowable be prorated on the per well or potential basis, there will result a physical waste of oil.

22. In holding that the quantity of recoverable oil in the field and in the various leases of the field can be determined with reasonable accuracy.

[fol. 839] 23. In holding that the fairway properties under the present method of proration are being and will be severely drained by the leases lying in the eastern part of the field.

24. In holding that the plaintiff's Todd "A" lease is suffering drainage under the present plan of proration to leases on the east side of the field.

25. In holding that under the present plan of proration the plaintiff will be prevented from recovering an amount of oil substantially equivalent to its original recoverable reserves or to its present recoverable reserves.

26. In holding that most pumping wells in the East Texas field can be operated at a profit on a daily production of as little as five barrels each.

27. In holding that the enforcement of the present plan of proration results in the taking of plaintiff's property and giving it to others without compensation and without any reasonable necessity.

28. In holding that the regulation of the Railroad Commission attached denies to the plaintiff a reasonable opportunity to recover its fair share of the oil ultimately and within a reasonable time.

29. In finding, without sufficient evidence to support such finding, that under the present and prior orders of the Railroad Commission of Texas, prorating the production of oil from the East Texas oil field, the plaintiff has not produced "over 200,000 barrels of oil it otherwise would have produced had said orders allocated the allowable among producers on a basis giving substantial consideration to recoverable oil in place, true potentials, position on structure or similar factors which bear on the quantity of recoverable oil under tracts and the ability to yield such oil."

[fol. 840] 30. In finding, without sufficient evidence to support such finding, that if the present or a similar plan of

proration is continued for the producing life of the field, plaintiff will be prevented from producing several hundred thousand barrels of recoverable oil originally and now under its lease.

31. In finding, without sufficient evidence to support such finding, that of the 25,900 wells in the East Texas field, about 15,000 of such wells could be closed in at the present time without creating waste.

32. In finding, without sufficient evidence to support such finding, that out of the 25,900 wells drilled in the East Texas field, about 15,000 of these wells could be closed in and leave operators with sufficient wells to drain their property.

33. In finding, without sufficient evidence to support such finding, that the density of drilling which has been permitted by the Railroad Commission of Texas after due notice and hearing as to the drilling of each well, does not exist as a result of an attempt to conserve the oil and gas.

34. In holding that the allocation of a base or minimum allowable of 20 barrels per well to each well in the field which was capable of producing 20 barrels or more per day is unreasonable and arbitrary.

35. In holding that there was no substantial evidence to sustain the base or minimum allowable of 20 barrels per well allocated by the Railroad Commission to each well in the field which was capable of producing 20 barrels or more per day.

36. In holding that the allowance of a minimum or base allowable of 20 barrels per day to all wells that can produce that amount of oil is not necessary to prevent waste.

37. In holding that the allowance of a minimum or base allowable of 20 barrels per day to all wells that can produce that amount of oil daily is not necessary to prevent drainage from one section of the field to another.

[fol. 841] 38. In holding that the allowance of a base or minimum allowable of 20 barrels per day to all wells that can produce that amount of oil daily is not necessary to prevent premature abandonment of wells.

39. In holding that the allowance of 20 barrels per well per day as a base or minimum allowable to all wells capable of producing that amount of oil daily creates waste of oil and energy.

40. In holding that the allowance of a base or minimum allowable of 20 barrels per day to each well in the field capable of producing that amount daily denies to the plaintiff the opportunity to produce its fair or proportionate share of the daily allowable.

41. In holding that the plaintiff's share of the total field allowable was not substantially increased by the orders of September 11, 1939, September 29, 1939, December 20, 1939, and January 24, 1940, as compared with the order of June 19, 1939.

42. In finding, without sufficient evidence to support such finding, that wells have not and will not be prematurely abandoned in the East Texas field with a production of five barrels per day.

43. In holding that the allocation of any substantial part of the allowable per well results in unnecessary and unreasonable drainage and waste.

44. In finding, without sufficient evidence to support such finding, that the time element will not "take care of plaintiff."

45. In finding, without sufficient evidence to support such finding, that the plaintiff does not have substantially as much recoverable oil beneath its lease as was under such lease originally.

[fol. 842] 46. In finding, without sufficient evidence to support such finding, that the premature abandonment of wells on the west side of the field will not result in the physical waste of oil and gas.

47. In finding, without sufficient evidence to support such finding, that practically all wells in the East Texas field have been drilled more than two years.

48. In holding that it is not necessary that the Railroad Commission give any consideration to the cost of drilling or the cost of pumping wells in the East Texas field in deter-

mining the amount of allowable that shall be assigned to each well in the field.

49. In the rendition of the final judgment dated May 28, 1940, in favor of plaintiff and against defendants.

Appellants designate the following parts of the record which they think necessary to be printed for the consideration of the foregoing points upon which appellants intend to rely:

1. Plaintiff's original complaint.

2. Defendants' answer to plaintiff's complaint.

3. Plaintiff's supplemental complaint.

4. Defendants' answer to plaintiff's supplemental complaint.

5. The reporter's transcript of the evidence, certified by H. P. Bickler, Court Reporter.

6. Opinion of the court, after trial on the merits February 21, 1940.

7. Final judgment of the court, dated May 28, 1940.

8. Findings of fact and conclusions of law, dated May 29, 1940.

9. Defendants' motion for a stay pending appeal.

10. Defendants' petition for appeal.

11. Defendants' assignment of errors.

12. Defendants' statement as to jurisdiction as required by Rule 12 of the Rules of the Supreme Court of the United States.

13. Order allowing appeal.

[fol. 843] 14. Citation on appeal, with acknowledgment of service thereof.

15. Appeal bond.

16. Stipulation of the parties as to the record.

17. Notice of appeal, etc., under Supreme Court Rule 12, and acknowledgment of service thereof, omitting exhibits.

18. This statement of points to be relied on and designation of parts of the record to be printed, and acknowledgment of service and stipulation thereon.

Gerald C. Mann, Attorney General of Texas. James P. Hart, Assistant Attorney General. E. R. Simmons, Assistant Attorney General. Edgar Cale, Assistant Attorney General. Tom D. Rowell, Jr., Assistant Attorney General. Attorney for Railroad Commission of Texas, et al., Appellants, Austin, Texas.

[fol. 844] Acknowledgment of Service

Service of the foregoing statement of the points on which appellants intend to rely and designation of the parts of the record to be printed is acknowledged by the undersigned attorney for appellee, Rowan & Nichols Oil Company, this 1st day of July, 1940.

D. M. Moody, Attorney for appellee, Rowan & Nichols Oil Company, Austin, Texas.

Stipulation as to Parts of Record to be Printed

The parties stipulate that the parts of the record designated by the appellants in the foregoing designation are the only parts of the record necessary to be printed for a consideration of the points upon which appellants intend to rely.

Dated this 1st day of July, 1940.

D. M. Moody, Attorney for Rowan & Nichols Oil Company, Appellee, Austin, Texas.

James P. Hart, Attorney for Railroad Commission of Texas, et al., Appellants, Austin, Texas.

[fol. 845] [File endorsement omitted.]

Endorsed on cover: File No. 44,567, W. Texas, D. C. U. S., Term No. 218, Railroad Commission of Texas, Lon A. Smith, Ernest O. Thompson and Jerry Sadler, Members of the Railroad Commission of Texas, et al., Appellants, vs. Rowan & Nichols Oil Company. Filed July 8, 1940, Term No. 218 O. T., 1940.